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Honourable Jack Davis, Minister

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FOREWORD

Mining in British Columbia was first produced as two volumes covering the years 1975-1980. The publication was designed to accompany GEM and the Annual Reports of the Minister. Volume I - Mine Production provided the location, a brief description, a summary of activity, and production statistics for major metal, coal and industrial mines in British Columbia. Volume II - Report of the Chief Inspector contained details of mine inspection and safety practices in mining, and provided an account of the work of the Inspection and Engineering Branch relating to all phases of mineral production. The subsequent publication Mining in British Columbia, 1980-1985, provided the same information in one volume.

In Mining in British Columbia, 1986-1987 the Report of the Chief Inspector was presented as Part 1, followed by Mine Production, Part 2, to reflect the emphasis the publication wished to place on the work of the Engineering and Inspection Branch.

The current edition, Mining in British Columbia, 1988, uses the format established in the preceding edition except that the order in which the information is presented in Part 1 - Report of the Chief Inspector has been changed, grouping related sections more closely together in the text.

Until 1980, this material was produced directly by the Ministry of Energy, Mines and Petroleum Resources. Subsequent volumes have been compiled and edited by Victoria-based Yorkshire Resources, primarily from reports by the provincial mines inspectors and private industry sources.

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PART 1 - REPORT OF THE CHIEF INSPECTOR

INTRODUCTION

The Engineering and Inspection Branch's activities are aimed at ensuring worker health and safety, public safety, and suitable reclamation and protection of land and watercourses affected by mining and exploration work. These activities are mandated by the Mines Act, the Mines Regulation, the Coal Mines Regulation and the Uranium Thorium Exploration Regulation.

The Mine Development Review Process (M.D.R.P.) ensures an in-depth, coordinated government review of, and public participation in, proposed major mine developments. Activity related to the operation of the M.D.R.P. is guided by working policy of the Environment and Land Use Committee of Cabinet. In May, 1988, the staff and responsibility for the administration of the M.D.R.P. were transferred from the Mineral Policy Branch to the Engineering and Inspection Branch to facilitate coordination of review and permitting functions.

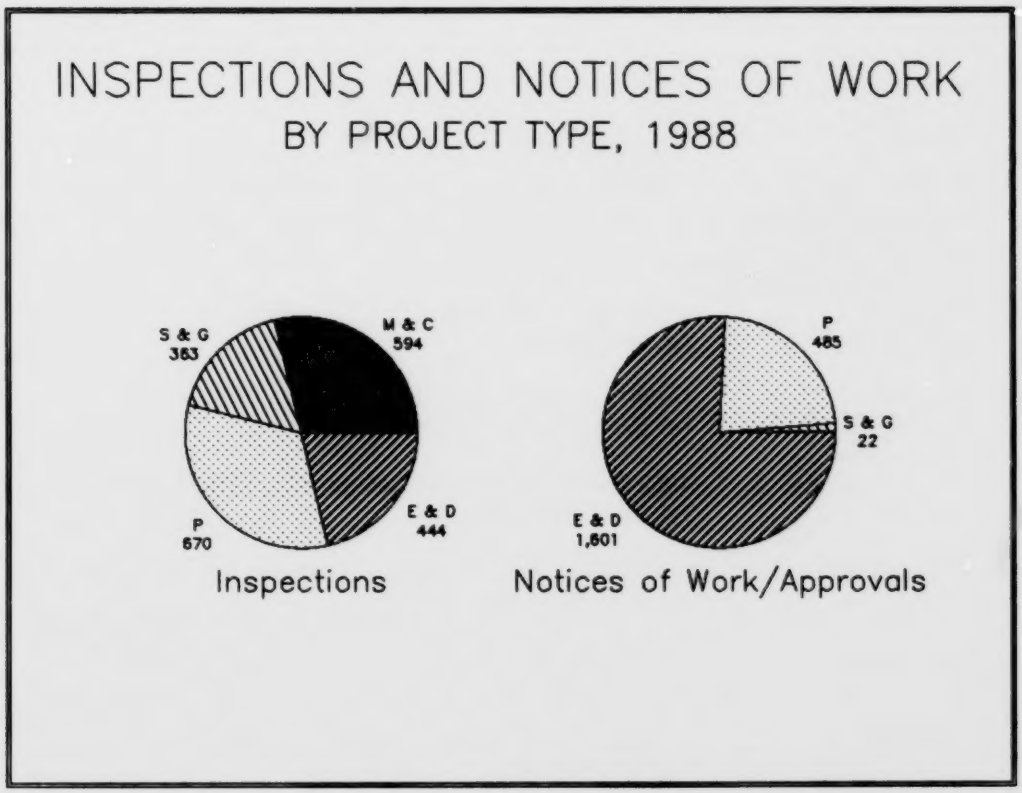
Inspectors of mines, located in district offices, conduct inspections of coal mines, metal mines, sand and gravel pits, placer mines and quarries, in accordance with the Mines Act and the prescribed regulations. Some contract inspectors conduct inspections on smaller, low-impact projects. Specialized research and support for field inspections is provided by Victoria-based professionals in the areas of reclamation, environmental control, geotechnical engineering, mechanical-electrical engineering and coal mining.

Figure 1 shows the Inspection Districts and the location of District and Other Offices. The mailing addresses of the offices are as follows:

Fernie:	Bag 1000, Fernie, B.C., V0B 1M0. Tel. (604) 423-6884.
Kamloops:	200-2985 Airport Drive, Kamloops, B.C., V2B 7W8. Tel. (604) 828-4566.
Nelson:	403 Vernon Street, Nelson, B.C., V1L 4E4. Tel. (604) 354-6125.
Nanaimo:	1A-3411 Shenton Road, Nanaimo, B.C., V9T 2H1. Tel. (604) 755-2486.
Prince George:	1652 Quinn Street, Prince George, B.C., V2N 1X3. Tel. (604) 565-6125.
Smithers:	Bag 5000, 3793 Alfred Avenue, Smithers, B.C., V0J 2N0. Tel. (604) 847-7383.
Vancouver:	150-800 Hornby Street, Vancouver, B.C., V6Z 2C5. Tel. (604) 660-9363.
Victoria:	105-525 Superior Street, Victoria, B.C., V8V 1X4. Tel. (604) 387-3781.

Inspections and Notices of Work by Project Type, 1988

Project Type	Inspections		Notices of Work/ Mining Approvals	
	(No.)	(%)	(No.)	(%)
Metal & Coal Mines (M & C)	594	28.7	3	0.1
Sand, Gravel Quarries (S & G)	363	17.5	22	1.0
Placer Mines (P)	670	32.4	485	23.0
Exploration & Development (E & D)	444	21.4	1601	75.8
Totals	2071	100.0	2111	100.0



MINING INSPECTION DISTRICTS AND OFFICES

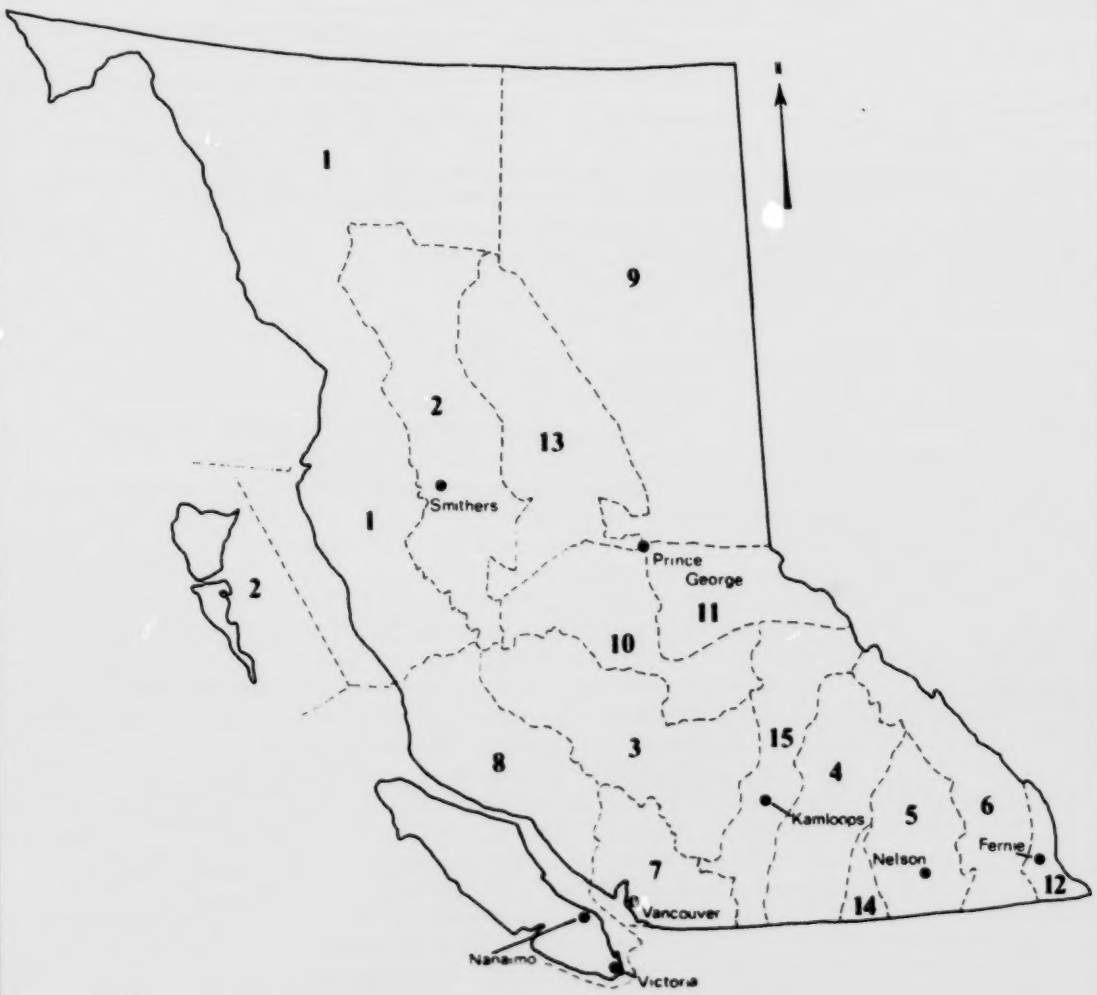


Figure 1

LEGISLATIVE CHANGES

By Order of the Lieutenant Governor in Council, OIC 1578/1988 amended sections 204, 220, 231 and 237 of the Coal Mines Regulation and sections 265, 273, 284 and 293 of the Mines Regulation.

STAFF

Branch personnel during 1988 was as follows:

Fernie:	A. Whale, District Inspector of Mines and Resident Engineer R. Booth, District Inspector of Mines and Resident Engineer G.A. MacDonald, Mechanical Inspector P.J. Switzer, Inspector of Mines (Mine Rescue) L. McIntyre, C.S.3 L. Northey, O.A.2 (Auxiliary)
Fort St. John:	E.J. Hall, Reclamation Inspector
Kamloops:	F.J.T. Hancock, District Inspector of Mines and Resident Engineer E. Sadar, District Inspector of Mines and Resident Engineer J.P. MacCulloch, District Inspector of Mines and Resident Engineer R. Heistad, Mechanical Inspector B.A. McConachie, Inspector of Mines (Mine Rescue) J.E. Beswick, Inspector of Mines L. MacCulloch, C.S.3 J. Worsfold, O.A.2
Nanaimo:	J.W. Robinson, District Inspector of Mines and Resident Engineer H.A. Armour, Inspector of Mines R.F. Brow, Inspector of Mines (Mine Rescue) R. Bone, District Inspector of Mines and Resident Engineer E. Beresford, Inspector of Mines J.C. Alvarez, Inspector of Mines G. Peachey, C.S.3
Nelson:	M.A. Mellor, District Inspector of Mines A.L. O'Bryan, Reclamation Inspector E.C. Ingham, Inspector of Mines (Mine Rescue) D. Bilinski, C.S.3
Prince George:	R.W. Lewis, District Inspector of Mines and Resident Engineer D. Turner, District Inspector of Mines and Resident Engineer J.J. Sutherland, District Inspector of Mines B.A. Gordon, Reclamation Inspector K. Hughes, Mechanical Inspector T. Burroughs, C.S.3 N. Wood, O.A.2

Smithers:	B. Good, District Inspector of Mines and Resident Engineer D. Flynn, District Inspector of Mines and Resident Engineer J.E.A. Lovestrom, Inspector of Mines (Mine Rescue) D. Porteous, Inspector of Mines E. Konschuh, C.S.3 J. Harris, O.A.2 S. Ciampichini, O.A.1
Vancouver:	B.M. Dudas, District Inspector of Mines and Resident Engineer S.J. Hunter, Inspector of Mines R. Kumar, Environmental Control Inspector V. Pyplacz, Environmental Control Inspector (Audiology) A. Parker, Environmental Control Inspector (Noise) J. Greene, C.S.3 B. Vaal-Henke, O.A.2
Victoria:	V.E. Dawson, Chief Inspector of Mines R.A. Fyles, Manager, Inspection Services T. Vaughan-Thomas, Manager, Health and Safety Standards R.W. McGinn, Manager, Inspection Services (until March) T.G. Carter, Senior Mechanical-Electrical Inspector R.F. King, Electrical Inspector J.E. Brenner, Roads Supervisor D.J. Murray, Senior Environmental Control Inspector J.C. Errington, Senior Reclamation Inspector D.M. Galbraith, Reclamation Inspector R.T. Martin, Senior Geotechnical Inspector R. Bone, District Inspector of Mines and Resident Engineer (also Nanaimo) P.J. Lindsay, Office Administrator R.L. Crook, Chairman, MDSC and Manager, Development Review and Approvals N. Ringstad, Secretary, MDSC A. Currie, Technical Assistant, MDSC (Auxiliary) L. Rennie, C.S.4 C. Howell, O.A.2 S. Ferguson, O.A.2 B. Hill, C.S.3 F. Gann, O.A.2 N. Morgan, O.A.2 J. Jensen, O.A.2 J. Bray, O.A.2 (Auxiliary) E. Seronik, Clerk 3

STAFF CHANGES

January, 1988: Stan Hunter retired from the Vancouver office after ten years with the Branch and Francine Gann resigned.

March, 1988: R.W. McGinn was temporarily appointed as Director and was confirmed in that position in November. Patrick Lindsay resigned after one year as the Branch Office Administrator. Janice Bray resigned after a short time as an auxiliary office assistant, and previously as a contract employee, to work in another Ministry. Carol Howell joined the Branch as an office assistant in the Reclamation Section.

Sueanne Ciampichini joined the Branch as an auxiliary employee in March, working as an office assistant in the Smithers office, and was confirmed as a regular employee in October.

Retirements at March 31, 1988 included: V.E. Dawson after 22 years; B.M. Dudas after almost 20 years; K. Hughes after 12 1/2 years; E.C. Ingham after 16 1/2 years; J. Lovestrom after 13 1/2 years; B.A. McConachie after 12 1/2 years; and J.W. Robinson after 20 years.

May, 1988: Ray Crook was transferred to the Branch as Chairman of the Mine Development Steering Committee (MDSC) and temporarily appointed as Manager, Development Review and Approvals. Norm Ringstad also joined the Branch as Secretary of the MDSC.

June, 1988: Jean Greene was relocated from the Vancouver Branch office to another Ministry after a reorganization within the Branch. Jim MacCulloch resigned from the Kamloops office after ten years with the Branch.

July, 1988: Bob Bone was transferred to the Nanaimo office.

August, 1988: Ted Hall was transferred from Fort St. John to the Smithers Branch office.

September, 1988: Brendan Gordon resigned from the Prince George office after eight years with the Branch.

October, 1988: Beverly Vaal-Henke was transferred to the Mineral Titles Branch in the Vancouver office after a reorganization within the Branch.

December, 1988: Anne Currie was hired to assist in the Mine Development Review section of the Branch.

MECHANICAL-ELECTRICAL

MECHANICAL

On-site inspections, investigations, and testing of new or modified equipment again received the most attention, though with a reduced number of staff.

A large proportion of resources was required for the review of the Mines Act and Regulations. Two of the most substantial parts of the proposed Regulations are "Buildings, Machinery and Equipment" and "Hoists and Shafts". The technical sub-committees charged with formulating the new Regulations were both chaired by a staff member and comprised industry and labour representatives.

The asbestos brake linings for large haul trucks have now been virtually phased out of production by North American manufacturers. Unfortunately, field tests conducted on non-asbestos brake linings did not always produce the results claimed for the linings. This was disappointing as some of the mines may soon be searching for a qualified lining.

A study of the hazards of coal handling at surface mines was undertaken and pursued in some depth. The safety practices instituted during the design, installation, operation and maintenance phases of the coal handling systems at surface coal mines in the province were all considered, and a paper prepared for publication.

Synopsis of Major Mechanical Surface Equipment in Use at Mines in British Columbia during 1988

Haulage Trucks

Type of Operation	Capacity (tonnes) 0-44	45-90	90+	Total
Coal Mines	51	61	230	342
Metal Mines	98	128	142	368
Others	142	29	3	174
Totals	291	218	375	884

Front-End Loaders

Type of Operation	Bucket Size (m3) 0-5.9.0	6.0-12.0	12.0+	Total
Coal Mines	23	28	49	100
Metal Mines	132	30	14	176
Others	150	21	1	172
Totals	305	79	64	448

Shovels

Type of Operation	Shovel size (m3) 0-5.9	6.0-12.0	12.0+	Total
Coal Mines	9	22	40	71
Metal Mines	10	37	35	82
Others	16	9	2	27
Totals	35	68	77	180

Rotary Drills

Type of Operation	Drill Diameter (mm) 0-99	100-200	200+	Total
Coal Mines	13	26	30	69
Metal Mines	116	33	26	175
Others	15	11	1	27
Totals	144	70	57	271

Mobile Cranes

Type of Operation	Lifting Capacity (tonnes) 0-9.9	10-20	20+	Total
Coal Mines	20	19	15	54
Metal Mines	48	25	17	90
Others	8	2	3	13
Totals	76	46	35	157

Other Equipment Over 5000 kg Mass

Type of Operation	Total
Coal Mines	242
Metal Mines	309
Others	100
Totals	651

*Includes service vehicles, backhoes, sand and water trucks, compactors, lift trucks, portable compressors, generators, screening plants, draglines, etc.

Synopsis of Major Mechanical Underground Equipment in Use at Mines in British Columbia during 1988

A total of 263 pieces of diesel powered equipment were in use. The following table shows the location and number of hoists in use.

Hoists in Use

Location	Number of Hoists
Sullivan	2
Myra Falls Operation (Westmin)	4
Bralorne	1
Parson Barite	1
Dentonia	1
Mosquito Creek	1
Total	10

ELECTRICAL

Electrical inspection activity continued throughout 1988 with particular emphasis on developments in the northwest part of the province.

Of importance was the Electrical Section's involvement in the M.D.A. (Canada/British Columbia Mineral Development Agreement to fund mining research and exploration projects) Study of Electrical Grounding Practices in Open Pit Mines. This work will lead to significant changes in electrical standards in mines throughout Canada.

Electrical Statistics

Metalliferous Mines

Kilovolt ampere capacity of company-owned generating plants	21,878 kVA
Reported power generated at company owned generating plants	10,302,000 kWH
Reported power purchased from public utilities	2,761,389,276 kWH
Total power consumption	2,871,691,276 kWH

The following table provides an analysis of connected load at operating metalliferous mines.

Connected Load at Metal Mines, 1988

Equipment	Rated Power (KW)
Trams and hoists	2,909
Electric shovels	18,678
Electric drills	6,612
Fans	12,013
Pumps	8,766
Rectifiers	3,566
M.G. sets	1,827
Aair compressors	19,470
Sink and float	3,221
Crushing	25,684
Grinding	191,406
Concentrating	115,634
Magnetic separation	369
Conveyors	33,009
Mill pumps	37,383
Fresh water pumps	41,044
Workshops	13,711
Miscellaneous	17,365
Total	557,758

Coal Mines

Reported power purchased from public utilities ..... 667,689,137 kWH

The following table provides an analysis of connected load at operating coal mines.

Connected Load at Coal Mines, 1988

Equipment	Rated Power (KW)
Draglines	6,490
Ventilation and drying	3,230
Electric shovels	43,193
Electric drills	13,692
Conveyors	10,305
Hoisting	166
Haulage	0
Coal breaker	3,137
Washing and screening	49,667
Pumping	26,389
Air compressors	3,305
Miscellaneous	52,305
Total	211,879

Industrial Minerals and Structural Materials

Due to the poor response to requests for statistics during this year, the figures given are not considered to be necessarily accurate for this sector but are provided as an indication of activity only.

Kilovolt ampere capacity of company-owned generating plants	21,808 kVA
Reported power generated at company owned generating plants	52,090,675 kWH
Reported power purchased from public utilities	23,026,245 kWH
Total power consumption	75,154,920 kWH

The following table provides a summary of power consumption at all types of operations since 1975.

Actual Consumption of Power (million kilowatt hours)

Year	Metal Mines	Industrial Minerals	Coal Mines	Total
1975	2,092.1	66.8	363.3	2,522.2
1976	2,125.7	80.9	211.2	2,417.8
1977	2,212.1	78.7	312.0	2,602.8
1978	2,057.9	67.9	289.2	2,415.0
1979	2,257.4	88.8	299.8	2,646.0
1980	2,359.3	95.1	277.9	2,732.3
1981	2,761.6	65.3	319.6	3,146.5
1982	2,605.5	77.5	330.4	3,013.4
1983	2,434.1	76.9	356.6	2,867.6
1984	1,975.0	91.2	578.4	2,644.6
1985	2,255.3	69.8	634.9	2,960.0
1986	2,338.4	51.1	581.8	2,971.3
1987	2,673.1	67.5	612.3	3,352.9
1988	2,871.7	75.2	667.7	3,614.6

ENVIRONMENTAL CONTROL

The Ministry of Energy, Mines and Petroleum Resources' Environmental Control Inspectors conduct inspection surveys for dust, asbestos fibre, ventilation, radon daughters, gases and noise at metal, coal and industrial minerals mines and quarries throughout the province.

Measurements of the ventilation, and observations of the condition of dust-control systems and other measurements relative to the prevention, suppression and elimination of dust and health hazards are conducted on a regular basis. Subsequently, recommendations and advice are given for improvements to assist in lowering the health hazard in general.

During 1988, environmental surveys were conducted at 45 mining operations which included underground metal mines; open pit metal, coal and asbestos mines; sand and gravel pits; and crushing plants, concentrators and assay grinding rooms. In addition, seven surveys were made at non-uranium underground mines for alpha and gamma radiation.

Eighty people participated in Industrial Audiometry courses taught by the audiologist at seven training courses and eleven refresher courses.

Seventeen noise exposure surveys were performed at mines.

In February, all members of the Section and most of the other Branch Inspectors attended a Mine Radiation Safety course put on by AECB - CAIRS in Vancouver.

The Workplace Hazardous Materials Information System (WHMIS) came into effect across Canada on October 31, 1988. All the Inspectors have taken a WHMIS training course.

A. Parker was chairman of the Industrial Hygiene sub-committee for revisions to the Mines Regulation.

The following tables show details of the audiometric and dust control programs during 1988.

Audiometric Training/Sound Survey Statistics, 1988

	1988
Audiometric technicians	
- number trained	29
- certificate renewal	51
Sound surveys	
- number conducted	17
- number of operations	17
Results:	
- workers wearing ear protection where required (%)	90
- drill mufflers in use (%)	100
- properties performing audiometric tests on workers (%)	100

Dust Control Inspections, 1988

Type of Inspection	1988
Metal, Coal, Asbestos, Uranium, Limestone and Rock Quarries:	
- number of inspections	48
- number of operations	44
Percent meeting standards (%):	
Underground mines	
- drilling	95
- other u/g operations	90
- crushing plants	92
- assay grinding rooms	100
Open Pit Mines	
- drilling	100
- other operations	100
- crushing plants	93
Structural and Industrial Minerals:	
- number of inspections	4
- number of operations	4
Percent meeting standards (%):	
- drilling	100
- crushing and screening	100

GEOTECHNICAL

Notwithstanding the many changes in Branch organization during 1988, the work of the Geotechnical Section continued unchanged from the previous year. Although more interest was taken in both open pits and sediment ponds this year, most of the activity again centred on waste emplacements. There was no net change in the number of mines with significant, active waste emplacements (29).

The number of mines inspected decreased to eleven. In addition, four investigations of unusual occurrences were conducted at sites, and four visits were made to mine sites for other reasons. The numbers of approvals and reviews under the Mine Development Review Process are not available, but are believed to be comparable to 1987 (16 approvals and 21 reviews).

The work of the sub-committee to prepare an initial draft of "Part 10, Dams and Dumps" for the proposed new Mines Act and Regulations was completed. In addition, a somewhat incomplete list of major tailings dams in British Columbia was submitted for inclusion in the tailings dam register being prepared by an international body known as I.C.O.L.D.

Interesting investigations of geotechnical events included two pitwall failures at Island Copper mine, and the massive dump failures 1660WN and 1660A at Quintette Coal mine. Failure of the dump for the South Falcon development at Greenhills Coal mine was still under study at the end of the year.

ROADS

Under the authority of the Ministry of Energy, Mines and Petroleum Resources Act, this Section operates the Mining and Petroleum Road Program to encourage and assist in the development of mineral resources in the province.

The Section provides technical advice, shared-cost assistance, review comments, terms of reference and field inspections of proposed road access routes and road construction in progress. In addition, assistance is provided to headquarters and district staff for review of and recommendations concerning contracts and haul roads on mine property.

The major projects in which the Section was involved during 1988 are as follows.

1. The Shared-Cost Road Grant Program

This program, established for the construction and/or maintenance of mining roads, was not supported due to continuing budgetary restrictions. However, the Section was very active in answering queries on old mining road right-of-ways, supplying information to various local and overseas agencies as well as the general public, and investigating the liability aspect of old mining roads which still exist in the province.

The Shared-Cost Road Grant Program was started in 1857-1858. Since then, more than 2000 files had accumulated creating significant storage problems. To rectify this, a program was set up to extract from old files all legal and monetary documentation indicating provincial participation in the construction and maintenance of mining roads. This information was then organized and entered into a computer program. Other historical information was sent to the Provincial Archives. All old mining roads still in existence that had public funds expended on them were plotted and recorded on 1:250,000 maps.

2. The Omineca Mine Road Extension

This road, which runs 104 kilometres from Moose Valley to the Lawyers property, received final approval, and Cheni Gold Inc. began construction in May, 1988. Road construction was completed to the Sturdee Airstrip, a distance of 76 kilometres, by December. Field inspections were made to ensure the required standards and procedures were followed.

3. The Golden Bear Access Road

The Section reviewed and commented on plans for the road and prepared Terms of Reference for the consultant to proceed with alternative studies. Recommendations were made for a route which would satisfy all regulatory agencies and other concerned parties. A report was presented on completion of these studies which was reviewed by the Section and comments were submitted to the Mine Development Review Committee.

Field inspections of various routes were made and specifications were prepared for access road construction. By mid-December, road construction was complete to approximately kilometre 115. A winter tote road was constructed to provide temporary access to the mine site, and to facilitate the transportation of equipment for further construction.

During the winter of 1988, the Ministry of Forests requested assistance to set up a Special Use Permit for a Spring Maintenance Program.

The Golden Bear Operating Company also initiated an investigation, in late fall, 1988, into a proposed relocation of the existing Telegraph Creek Road to try and reduce road grades in the Tuya River area.

4. The Mount Klappan Road Access

Previous studies and files were reviewed and comments made on the status of this project.

5. The Newhawk Gold Project (Sulphurets) Road Access

Terms of Reference for a consultant's study of access routes were prepared, and review of the resulting report completed. The proposed routes were inspected to address various environmental concerns, and to assess the ferry-road combination which was later presented. Assistance was given in the preparation of a Ministry of Forests' Special Use Permit.

6. The Mount Washington Project

The Section assisted in preparing and reviewing a draft contract for consultant's services which was presented to the Manager in charge of the project. The final draft was reviewed and commented on.

7. The Windy Craggy Road Access Project

This project was initiated in early 1988, and on May 17 a meeting was held with the company and government agencies. Following this meeting, a prospectus and report were presented for review of potential road access corridors.

8. The Iskut Road Access Study

This study was initiated by the Ministry in November, 1988 to determine the possibility of road construction down the Iskut Valley to Bronson Creek. Terms of Reference and a contract were prepared for the study, and consultants were invited to submit bids for the work.

In addition, a request was received from the office of the Minister of State to review and comment on a consultant's report on access into Monkman Provincial Park in the northeast part of the province. A request was also received from this Ministry's district office in Smithers to review plans for Westmin Mines Ltd.'s road to the Big Missouri pit near Stewart, B.C.

RECLAMATION

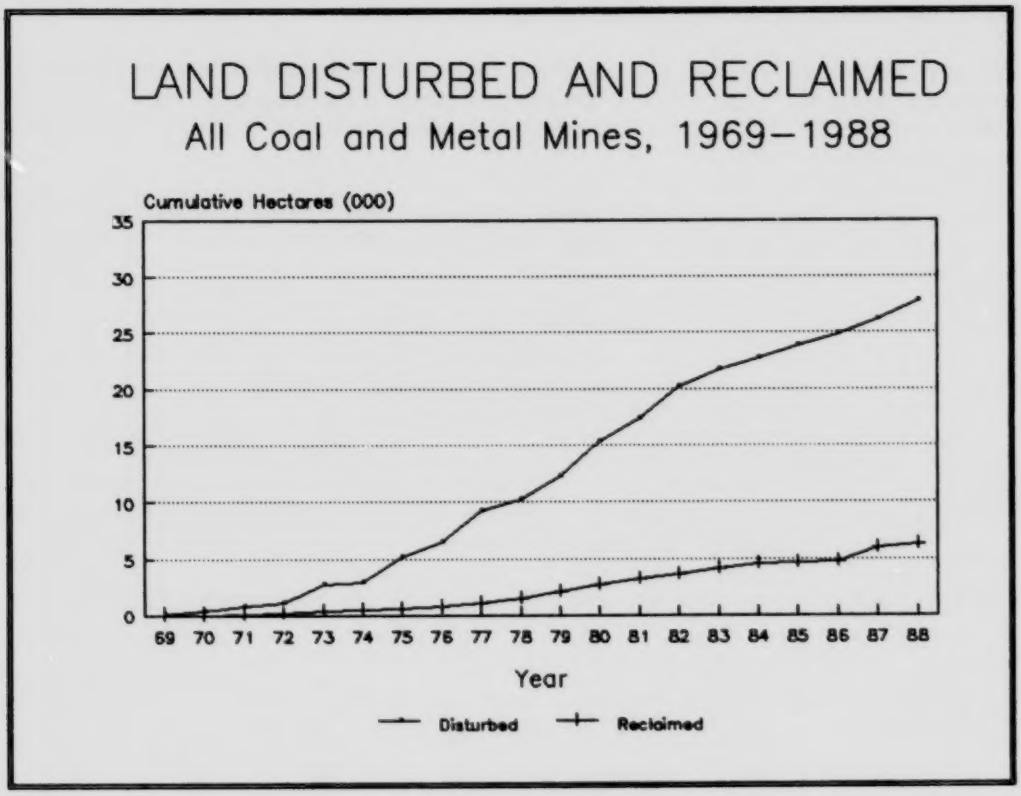
Mine reclamation legislation was first enacted in British Columbia in 1969, and all lands disturbed by mining are now required to be reclaimed by mining companies.

Since 1969 the mining industry has expanded from one composed almost exclusively of underground operations, to an industry consisting of mainly large scale open pits. The coal industry has expanded greatly along with the copper industry, and lately gold mining is again becoming important.

The mining industry now utilizes a much greater land base. Major coal and metal mines which occupied less than 1000 hectares in the late 1960s, now cover 27,764 hectares. Revegetation activities have reclaimed a total of 23% of the land or 6,282 hectares.

Mining Land Disturbance and Reclamation, 1969-1988
(Cumulative Hectares)

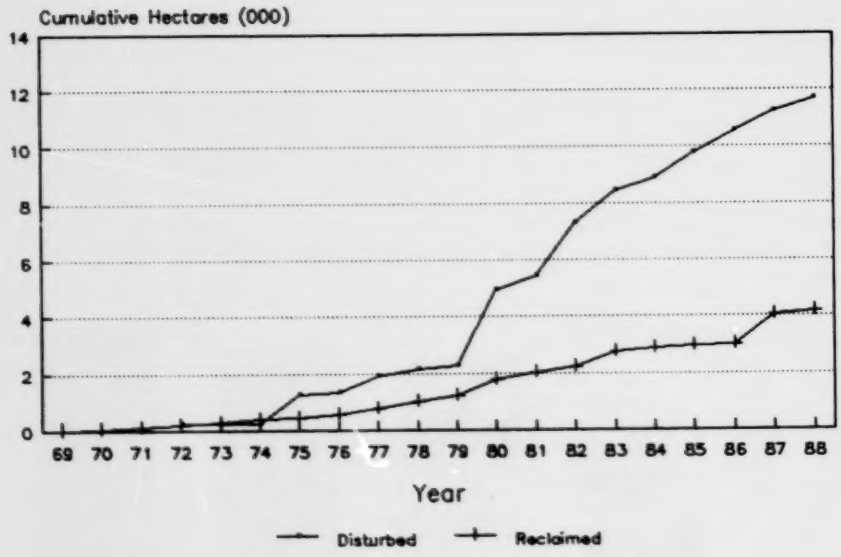
Year	Disturbed			Reclaimed			Balance
	Coal Mines	Metal Mines	Total	Metal Mines	Coal Mines	Total	
69	0	144	144	0	0	0	144
70	0	379	379	0	50	50	329
71	0	839	839	2	106	108	731
72	234	893	1127	2	200	202	925
73	234	2522	2756	109	280	389	2367
74	260	2683	2943	109	386	495	2448
75	1271	3928	5199	144	462	606	4593
76	1320	5211	6531	214	584	798	5733
77	1888	7337	9225	321	752	1073	8152
78	2132	8095	10227	543	1006	1549	8678
79	2262	9976	12238	866	1218	2084	10154
80	4933	10380	15313	990	1765	2755	12558
81	5429	11953	17382	1233	2009	3242	14140
82	7307	12828	20135	1394	2225	3619	16516
83	8435	13283	21718	1452	2754	4206	17512
84	8891	13795	22686	1654	2884	4538	18148
85	9758	14092	23850	1731	2977	4708	19142
86	10552	14296	24848	1772	3003	4776	20073
87	11245	14962	26207	1897	4037	5934	20273
88	11670	16094	27764	2095	4187	6282	21482



The graphs below show the separate breakdown of disturbed and reclaimed land at all metal and all coal mines. By themselves coal mines have disturbed 11,670 hectares, and 4,187 hectares, or 36%, have been reclaimed. Metal mines have disturbed 16,094 hectares, but only 2,095 hectares, or 13%, have been reclaimed.

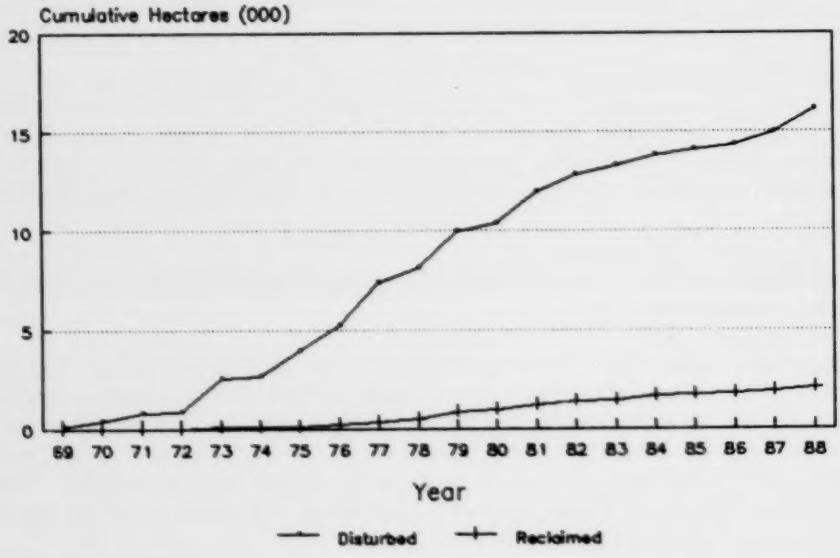
LAND DISTURBED AND RECLAIMED

All Coal Mines, 1970–1988

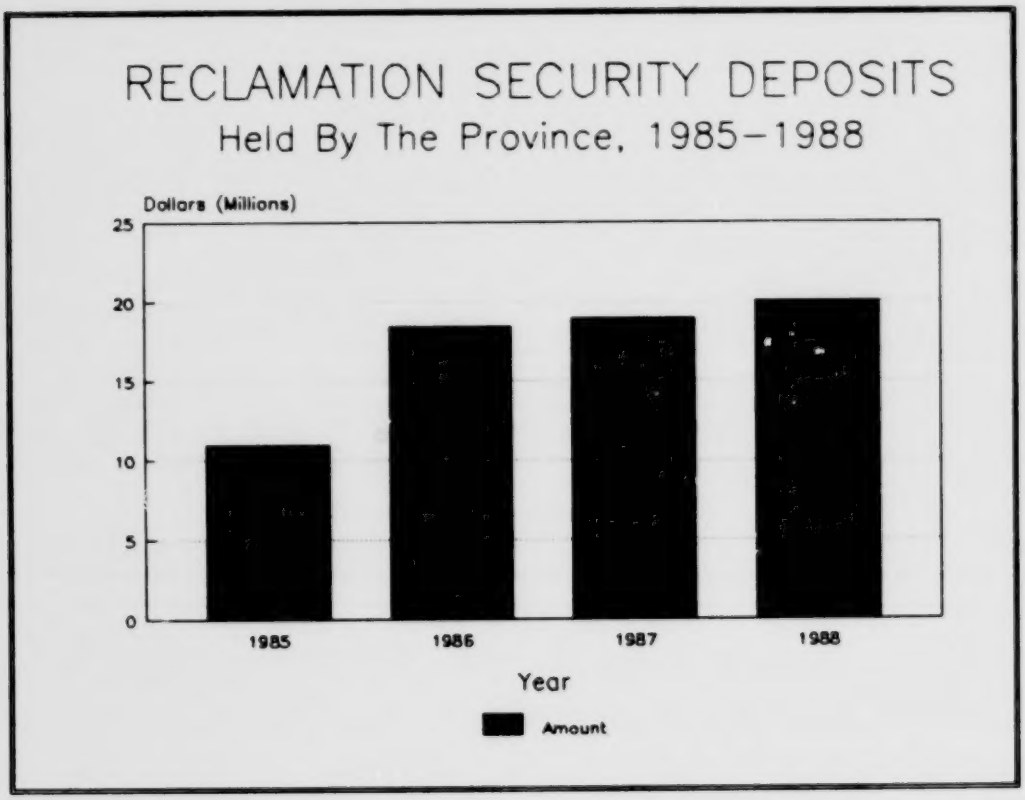


LAND DISTURBED AND RECLAIMED

All Metal Mines, 1969–1988



Reclamation Permits must be applied for and held by all mining companies working in British Columbia. Security deposits are required as a condition of all reclamation permits to ensure that reclamation programs are adequately completed. By the end of 1988, total reclamation security held by the Province was $20,061,400. The total security held has almost doubled over the last four years.



As well as the increasing land base occupied by mines, the potential for acid mine drainage has strongly influenced mine reclamation guidelines and legislation. The environmental and social consequences of uncontrolled acid effluent could have a major impact on water quality far from the mine site. Of the 16 metal mines currently operating in British Columbia, six are producing acid mine drainage and several more have the potential to produce acid mine drainage but are not yet doing so.

Of the eight operating coal mines, none are presently generating acid mine drainage although one has the potential to do so.

The widespread concern over acid mine drainage led, in 1988, to the formation of the B.C. Acid Mine Drainage Task Force. The Task Force combines the talents of industry, academia, and the Provincial and Federal governments, and it has the objective to develop cost effective solutions to acid mine drainage. A Steering Committee, chaired by the Chief Inspector coordinates activity in association with three technical sub-committees: Prediction and Prevention, Treatment and Control, and Monitoring. These technical committees are responsible for developing and implementing solutions to the problem of acid mine drainage.

During 1988, the following studies were coordinated by the Task Force:

Draft Acid Rock Drainage Technical Guide;

Kutcho Creek Project: Acid Generation (Blending and Segregation) Test Work; and,

Westmin Resources Ltd.: Methods to Control Acid Generation on Waste Rock, Phase II.

Funding for these studies was provided, in part, by the Mineral Development Agreement, a joint Federal/Provincial program.

As well, the Provincial government undertook a program to abate acid mine drainage on the Mount Washington mine near Courtenay on Vancouver Island. The Mount Washington copper mine closed in 1967 before any reclamation requirements were in place. Acid mine drainage from the waste rock dumps is contaminated with copper of sufficient strength to adversely affect fish populations in the Tsolum River. During 1988, a portion of the waste dumps was recontoured and covered with a blanket of glacial till material in order to seal the waste rock and limit both water and oxygen movement. Fall rains prevented the completion of the project.

Reclamation staff work in close cooperation with members of industry and universities through the Technical and Research Committee on Reclamation. This committee has been active in supporting and fostering reclamation research and information exchange to ensure that technological advances in reclamation are disseminated rapidly throughout the mining industry.

Once again, the Technical and Research Committee organized the annual Mine Reclamation Symposium in Vernon, British Columbia. This twelfth annual symposium saw one hundred and sixty delegates attend presentations on many aspects of mine reclamation which followed the theme of Reclamation in Changing Economic Times.

During the symposium, awards and citations honoring outstanding achievements in mine reclamation were presented. The Annual B.C. Mine Reclamation Award was presented to Equity Silver Mines Ltd. Citations were presented to Afton Mines Ltd. for Metal Mining and to Westar Mining, Balmer Operation for Coal Mining.

MINE RESCUE, SAFETY AND FIRST AID

The promotion of mine rescue, safety and first aid, and the provision of assistance to the industry, are key functions of the Engineering and Inspection Branch.

Six district mine rescue stations were fully maintained, one in each of the districts of Fernie, Nelson, Kamloops, Nanaimo, Prince George and Smithers. The stations are under the supervision of the District Office Administrative Inspector of Mines, and the Mine Emergency Preparedness Committee in Victoria.

Each station is established as a mobile unit to transport equipment to anywhere in the area. They are available for either rescue or training services, and carry sufficient self-contained breathing equipment to maintain at least two six-man rescue teams.

The mine rescue equipment owned by the Ministry of Energy, Mines and Petroleum Resources in 1988 was: 59 Aerorlox; three hour liquid oxygen breathing apparatus; 43 Draeger B.G.174; 20 (30 minute) pressure/demand Airpak units; and 29 Chemox chemically produced oxygen units.

The mine rescue equipment owned by industry in 1988 was: 18 Aerorlox; 82 Draeger B.G.174, 125 (30 minute) Airpak units; and 59 Chemox units. Each station, and most mines, also have auxiliary equipment such as Type N gas masks, self-rescuers, gas detectors, oxygen therapy units and first-aid equipment.

The following table shows the mine rescue certificates issued in 1988.

Mine Rescue Certifications, 1988

Type of certificate	Number Issued
Mine rescue survival instructor	2
Mine rescue survival	65
Underground mine rescue	69
Surface mine rescue instructor	1
Surface mine rescue	134
Gravel pit rescue	0
Advanced mine rescue	8
Underground mine rescue instructor	1
Safety oriented first-aid	0
Total	280

Five mine safety associations, sponsored by the Ministry of Energy, Mines and Petroleum Resources and the Workers' Compensation Board, continued to operate in different areas of the Province. These associations are:

1. the Vancouver Island Mine and Industrial Safety Association;
2. the East Kootenay Mine and Industrial Safety Association;
3. the West Kootenay Mine and Industrial Safety Association:
4. the South/Central B.C. Mine Safety Association; and
5. the North B.C. Mine Safety Association.

The associations consist of representatives from industry, the Engineering and Inspection Branch, the Workers' Compensation Board and St. John's Ambulance. Each association promotes mine rescue training, first-aid training and safety education in their respective district.

MINE DEVELOPMENT REVIEW PROCESS

The Mine Development Review Process (M.D.R.P.) is the province's standard mechanism for the review and approval of sound, publicly acceptable mine developments.

In May, 1988, the staff and responsibility for the administration of the Mine Development Review Process were transferred from the Mineral Policy Branch to the Engineering and Inspection Branch to facilitate coordination of review and permitting functions.

During 1988, a number of mine projects moved closer to production decisions under the M.D.R.P. Seven mine projects received approval-in-principle and advanced to Stage III, the licensing stage of the review process.

Prominent in the review process during the year were:

- the Island Copper Extension Project, which received approval-in-principle in January, 1988;

- the Hedley Gold Tailings Project, involving heap leaching of old gold tailings, which received approval-in-principle in February, 1988;

- the Cassiar Asbestos Mine Extension (the McDame development), which received approval-in-principle in July, 1988; and

- the Samatosum Silver Project, which received approval-in-principle in November, 1988.

The review process handled a record workload in 1988, consisting primarily of precious metals projects. Over the year, 40 submissions were received by the Mine Development Steering Committee.

BOARDS OF EXAMINERS

Mines Other than Coal Mines

R.W. McGinn, Chairman	Victoria
B.M. Dudas/R. Bone	Vancouver/Kamloops
E. Sadar	Kamloops

This Board of Examiners consists of the Chief Inspector as Chairman and two other inspectors appointed by the Minister as members. Under the Mines Act, the Board conducts the examination of applicants for underground and open pit shiftboss certificates, and issues certificates at all mines other than coal mines.

Coal Mines

R.W. McGinn, Chairman	Victoria
T. Vaughan-Thomas	Victoria
R. Bone	Victoria/Nanaimo

This Board of Examiners consists of the Chief Inspector as Chairman and two other inspectors appointed by the Minister as members. Under the Mines Act, the Board conducts the examination of applicants for shiftboss certificates and certificates of competency, and issues those certificates for coal mines.

SHIFTBOSS CERTIFICATES

Section 24 of the Mines Act requires that every person employed underground or in open pit workings must be under the daily supervision of an official who is the holder of a shiftboss certificate issued under the Act. In addition, section 32 of the Mines Act specifies that every person employed in open pit workings at a coal mine be under the daily supervision of a shiftboss or other official who is the holder of an open pit shiftboss certificate issued under the Act.

An applicant for a shiftboss certificate must hold a non-restricted blasting certificate (gravel pits excluded), a mine rescue certificate (surface or underground as requisite), and a currently valid first-aid certificate. The applicant must also pass an examination on the rules and regulations contained in the respective Acts.

Four different certificates are issued: one for underground metal mining operations; one for open pit coal mining operations; one for open pit metal mining operations; and one for sand-, gravel- and clay-removal operations. A fee of $50 is charged for the examination and the passing grade is 65%. When it considers it advisable, the Board of Examiners may also grant provisional certificates on a one-time basis for a period of six months.

The following tables show the certifications for 1988.

Total Shiftboss Certification Activity, 1988

Activity	Number
applications received	155
examinations written	116
number passed	104
number of certificates issued	73

Shiftboss Certificates Issued by Type, 1988

Type of Certificate	Number
underground metal	33
open pit coal	15
open pit metal	23
gravel pits	2
provisional	72

CERTIFICATES OF COMPETENCY

Sections 32, 33 and 34 of the Mines Act require that managers and certain other supervisory officials at underground and open pit coal mines shall be holders of certificates of competency issued under this Act. The Board of Examiners, appointed by the Minister, is responsible for setting examinations for these certificates from time-to-time, for considering applications, for interchange certificates, and for issuing certificates.

Certificates are issued in accordance with section 35 of the Act. The certificates and corresponding fees are as follows:

First Class Certificate of Competency-Underground	$100.00
Second Class Certificate of Competency-Underground	$ 75.00
Third Class Certificate of Competency-Underground	$ 50.00
Mine Surveyor Certificate	$100.00

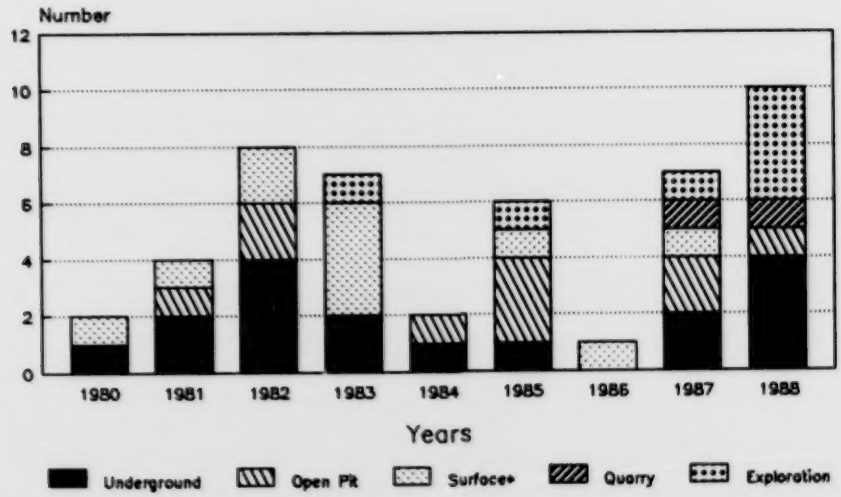
There were no certificates of competency issued in 1988.

There were two Mine Surveyor Certificates issued in 1988 to Mr. D.R. Armsworthy and Mr. D.J. Cope.

FATAL ACCIDENTS

There were seven fatal accidents during 1988 which took a total of ten lives. Regrettably, one accident, which occurred off the work site and was not a direct result of mining activity, claimed the lives of four people (see #4 below). This total of ten fatalities is, therefore, unusually high, and is up from the average of four per year for 1986-1987, and 5.4 per year for 1981-1985.

The following table provides a summary of mining fatalities from 1980-1988. These figures exclude deaths by natural causes; proven suicides and homicides; and deaths off a mine site such as helicopter crashes and motor-vehicle accidents. Fatalities that occurred at placer mines and sand and gravel operations are included under Quarry. Note that accidents at these operations may not be reported in the text of Mining in British Columbia.



*Includes facilities, roads, etc.

B.C. Mining Fatalities, 1980-1988

Year	Underground	Open Pit	Plant*	Quarry	Exploration	Total
1980	1	0	1	0	0	2
1981	2	1	1	0	0	4
1982	4	2	2	0	0	8
1983	2	0	4	0	1	7
1984	1	1	0	0	0	2
1985	1	3	1	0	1	6
1986	0	0	1	0	0	1
1987	2	2	1	1	1	7
1988	4	1	0	1	4	10
Totals (#)	17	10	11	2	7	47
Totals (%)	36%	21%	23%	4%	14%	100%

* Includes surface facilities, roads, etc.

The locations of the accidents in 1988 were as follows:

Location of Fatal Accidents, 1988

Location	No. of Accidents	Type of Operation	Accidents in 1986-87
Cassiar mine	1	open pit asbestos	0
Columario Gold Project	1	underground exploration	0
Carnation mine	1	underground metal	0
Ko-Ken mine	1	placer gold mine	0
Erickson Gold mine	1	underground metal	0
Johnny Mountain mine	1	underground metal	0

The four other fatalities occurred as a result of a boating accident on Tatsamenie Lake, and involved employees on the Tatsamenie exploration project.

DESCRIPTION OF FATAL ACCIDENTS

1.
Name: Gert Hagemann Age: 46
Date: January 14, 1988, 1030 hours
Location: Cassiar mine

Gert Hagemann was fatally injured when the haul truck he was driving left the roadway and rolled down a bank. Reports from witnesses suggest that Hagemann may have been having some sort of difficulty with the truck. There were no witnesses to the actual accident, but indications show that the truck was travelling at top speed, and that roll-over started as soon as the left front wheel was airborne. Subsequent investigation showed no mechanical failure of the truck. Hagemann was not wearing his seat belt.

An inquest was held on May 16, 1988, at Prince George, B.C. The death was ruled accidental and the following recommendations were made:

> 1) That qualifications for members of the Mine Rescue team and First Aid manpower be reviewed to ensure employees receive prompt and skilled First Aid attention.
>
> 2) That the use of seat belts by haulage truck operators be mandatory under the Act or Regulations.

2.
Name: Hans Jurgen B. Staar Age: 47
Date: February 26, 1988
Location: Columario Gold Project

Hans Staar received fatal injuries in a massive fall of ground from the left wall and back of an adit. At the time of the accident, Mr. Staar was working on the re-opening of a portal. There was no prior indication of the movement; the fall was sudden and caught Staar completely by surprise. It is probable that frozen groundwater hid the fact that the ground was loose. The thawing ice, coupled with concussion from blasting, is believed to be the cause of the fall of ground.

No inquest was held as Staar's death was considered purely accidental.

3.
Name: James Richard McDonaugh Age:44
Date: June 15, 1988
Location: Carnation mine

At the time of the accident, Mr. McDonaugh was hand tramming with an end-dump, one-tonne car on a small mine adit re-opening job. McDonaugh received fatal injuries when the car he was pushing went over the dump after hitting the stop blocks with too much speed. As the car was going over the dump, McDonaugh's right glove got caught on the car dumping lever, causing him to cartwheel over the dump with the car.

An inquest was held on January 18, 1989, in Nelson, B.C. The death was ruled accidental and the following recommendations were given:

1) That mining operations in British Columbia still employing hand tramming operations be identified, and the circumstances of this incident be circulated to those companies.

2) That hand tram dumping sites be closely inspected to ensure the site is secure and the dumping methods are safe.

4.
Name: William W. Timmins Age: 23
Anthony Brandt Age: 21
Lance Parrish Age: 25
Simon T Guest Age: 22
Date: On or about July 29, 1988
Location: Tatsamenie Lake

The four men, all employed by W.G.T. Consultants Ltd., died as a result of drowning and hypothermia. No signs of foul play were found and there were no witnesses to the accident.

It appears that, against much advice, the men set off in a canoe across the lake to the work site. There were several dangers inherent in this action:

a. It was a 15' 2-man canoe.
b. Tatsamenie Lake is prone to sudden, violent weather causing high waves, and is very cold. The canoe would be unstable under these conditions since it was not motorized, a condition aggravated by the extra weight of four persons..
c. The men were crossing the lake when they had been advised to go around, hugging the shoreline.

It was also found that the offer of a more suitable inflatable boat was rejected by the crew leader.

The men were wearing personal flotation devices; however, the water is very cold in this glacier-fed lake, and a person immersed in it without any other form of protection would rapidly suffer the effects of hypothermia.

An inquest was held on February 21, 1989, in Burnaby, B.C. The jury found the deaths to be accidental. The recommendations were as follows:

1) That the B.C. and Yukon Chamber of Mines publish a bulletin giving an account of this incident, and issue it to their members.

2) a. That notification of abandoned or empty vessels floating on the surface of water should be made to the R.C.M.P. when observed.

b. That all small vessels (canoes, zodiacs, etc.) have specification plates stating maximum load, recommended size of outboard motor, and maximum number of persons allowed.

c. That an orange strip, or other recommended colour, be placed along the keel of all small vessels so that when overturned in water they can be more easily detected from the air.

d. That the "Safe Boating Pamphlet", issued by the Canadian Coast Guard, be amended to include a fifth class of personal buoyancy device titled "Immersion Suit and Floater Jacket with Beaver Tail".

e. That a section be added to the "Safe Boating Pamphlet" outlining the cause, effect and prevention of hypothermia.

3) That a copy of the B.C. and Yukon Chamber of Mines safety booklet, or similar booklet, be issued to all exploration personnel. These booklets could be sent by the Ministry of Energy, Mines and Petroleum Resources when Notice of Work Permits are issued. The possession of this booklet by each exploration member could be checked by the Inspector of Mines during his campsite inspections.

5.
Name: Jody Stout Age:23
Date: September 28, 1988, approximately 0900 hours
Location: Ko-Ken Mining placer gold mine near Atlin, B.C.

Jody Stout drowned when the vehicle he was operating entered a tailings impoundment. Mr. Stout was building up a 25'-wide dam with the loader. It appears that he approached the edge of the berm at an angle and one wheel went over the edge. The machine tumbled into the pond with the normal access door side down. The right side of the unit was equipped with an emergency escape window; however, it appears Mr. Stout, in the murky water, was unable to unlock and open the window or break it under 25cm of water. The window had no exterior unlatching device.

A hazard alert on this problem has been issued, and a safety audit has been undertaken to determine training and supervision experience in these smaller mining operations.

6.
Name: William Oliver Hunter
Date: October 22, 1988, approximately 1345 hours
Location: Erickson Gold Mine

William Hunter was fatally injured when he was struck, and momentarily pinned between the rear of a power pole truck he was operating and the bucket of a caterpillar backhoe. Mr. Hunter was an employee of Lakewood Electric of Prince George, B.C., a contractor installing a new power line at the Erickson Gold Mine site.

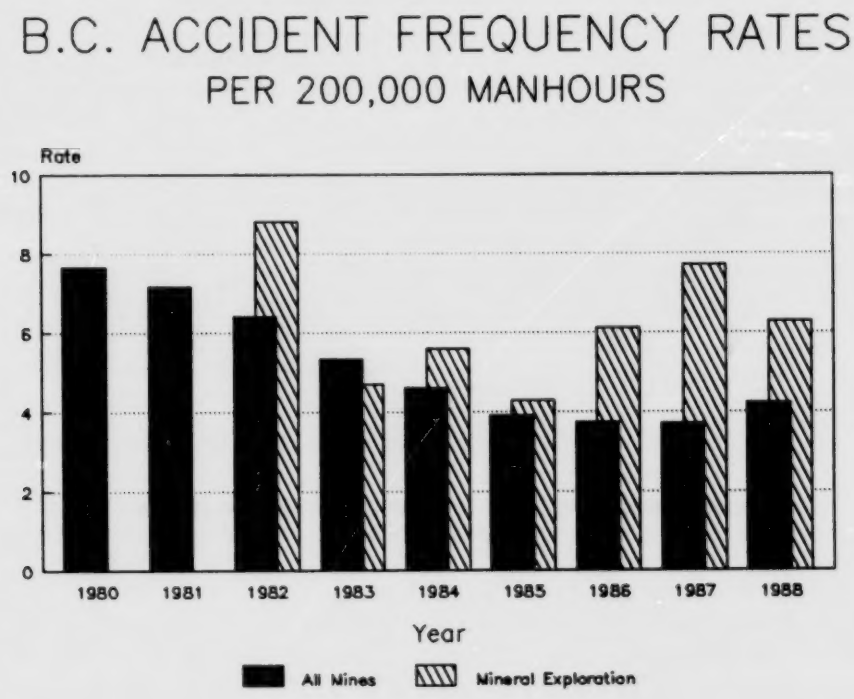
The accident investigation revealed that the pole truck was located too close to the excavation. In addition, Mr. Hunter entered a dangerous area between the excavation and the truck, a blind area for the backhoe operator, without alerting the operator of his intentions.

7.
Name: Kelly McKew
Date: December 20, 1988, approximately 0550 hours
Location: Johnny Mountain mine

The accident occurred in the mill at Skyline Explorations' Johnny Mountain mine. Mr. McKew's left hand and arm got caught between the belt and tail pulley of the Number 1 conveyor and he was drawn into the tail pulley, preventing respiration. He died of asphyxiation before he could be freed. There were no witnesses to the accident, although there were four workers on shift at the time.

ACCIDENTS CAUSING DEATH OR INJURY

The following graph and table illustrate a decrease in accident frequency rates since the beginning of the decade. However, as with this year's fatalities, incidents relating to mineral exploration continue to outnumber those in producing mines.



Year	All Mines	Mineral Exploration
1980	7.64	N/A
1981	7.16	N/A
1982	6.40	8.8
1983	5.33	4.7
1984	4.61	5.6
1985	3.90	4.3
1986	3.74	6.1
1987	3.71	7.7
1988	4.23	6.3

The following tables classify the accidents causing injury or death that were reported to the Branch by cause, occupation and parts of the body injured.

Accidents causing injury or death by cause, 1988

Cause	No.	Percent*
Atmosphere	0	0.00
Explosives	1	0.30
Falls of ground	15	4.61
Falls of persons	97	29.75
Lifting and handling material	73	22.46
Machinery and tools	111	34.15
Transportation	11	3.38
Miscellaneous	17	5.23
Totals	325	100.00

* percentage of total accidents

Accidents causing injury or death by occupation of those injured, 1988

Occupation	No.	Percent*
Underground		
Chutemen		0.00
Haulagemen	10	3.07
Miners	55	16.92
Helpers	2	0.61
Timbermen and facemen	2	0.61
Mechanics (electricians, supplymen, welders, etc.)	11	3.38
Miscellaneous	13	4.00
Surface		
Mechanics, electricians repairmen	95	29.23
Mill and crusher workers	36	11.07
Carpenters	1	0.30
Labourers, surveyors, construction, etc.	20	6.15
Miners, drillers	7	2.15
Vehicle drivers	62	19.07
Miscellaneous	11	3.38
Totals	325	100.00

* percentage of total accidents

Accidents causing injury or death by parts of the body, 1988

Part of the body	No.	Percent[1]
Eyes	16	4.38
Head, face, neck	42	11.50
Trunk	131	35.85
Upper extremities	82	22.46
Lower extremities	92	25.20
General	2	0.54
Totals	365[2]	100.00

[1] Percentage of total accidents
[2] Total number of times each part of the body was injured. More than one part of the body may be injured in each accident, so total number greater than shown on previous two tables.

DANGEROUS AND/OR UNUSUAL OCCURRENCES

Section 13 of the Mines Act requires that all dangerous and/or unusual occurrences at any mining operation be reported to the Inspector of Mines, and the local union or safety committee, within 24 hours of their happening, whether an actual injury occurred or not. It is established that the detailed study of such occurrences, and the dissemination of information about the causes, can help to reduce future accidents. Consequently, the Engineering and Inspection Branch attempts to study and distribute the information as widely as possible.

The statistics concerning these occurrences in 1988 are tabulated below. Condensed summaries of all occurrences are compiled and issued periodically by the Branch.

Dangerous and/or unusual occurrences by nature of occurrence, 1988

Nature of occurrence	Surface	Underground
Vehicle and mobile equipment operation	27	0
Fires	10	3
Explosives handling and use	1	2
Caught in machinery	0	0
Electrical failure or misuses	1	1
Equipment failure or misuses	8	5
Falls of ground	5	3
Falls of persons	1	2
Mishandling of chemical substances	0	0
Drilling	0	0
Miscellaneous	4	2
Total	57	18

PROSECUTIONS

There were no prosecutions in 1988.

BLASTING CERTIFICATE SUSPENSIONS

Mr. W.R. Roberts was suspended for a period of one month for transporting loose sticks of xactex and one reel of detonating cord on a scooptram at Sullivan Mine.

Mr. P. Lebeuf was suspended for a period of two weeks for drilling within 15cm of bootlegs/old holes at Lynx Mine.

Mr. G. Roy had his certificate cancelled until successful completion of a blasting examination for failure to report missed holes at Sullivan Mine.

COMPETITIONS

Interest in mine safety and rescue work is stimulated by the various competitions held annually between mines in the province and across the country. These competitions are in five categories:

1. Mine Rescue - Underground and Surface.
2. Underground Bench Competition.
3. Safety Competitions based on annual accident frequency for: A. Small Mines and B. Open Pit Mines and Quarries.
4. First-aid Competitions.
5. John T. Ryan Trophies, open to all Canadian mines, with one division for metal mines and one for coal mines. These trophies, which are awarded annually on both a regional and Canada-wide basis, are based on accident frequency results.

1. Mine Rescue - Underground and Surface

Underground

Underground rescue teams compete directly in the Provincial Competition. In 1988, the winner of the Provincial Underground Mine Rescue Competition was Cominco Ltd. (Sullivan mine). There was no Canadian Championship.

Surface

District surface mine rescue competitions were held by the following safety associations in 1988: East Kootenay, South/Central and North. Both the first and second place teams went on to compete in the Provincial Championship. The district winners were as follows:

East Kootenay Mine and Industrial Safety Association:	Westar Mining Ltd. (Greenhills mine) Westar Mining Ltd. (Balmer mine)
South/Central B.C. Mine Safety Association:	Highland Valley Copper Ltd. B.H.P. Utah Mines Ltd.
North B.C. Mine Safety Association:	Equity Silver Mines Ltd. Teck Corp. (Bullmoose mine)

The Provincial Surface Mine Rescue Competition was won by Equity Silver Mines Ltd.

There is no Canadian surface rescue competition.

2. Underground Bench Competition

The Provincial Underground Bench Competition was instituted in 1978. Competing teams must demonstrate their proficiency in the examination and testing of their apparatus prior to use. The event is in memory of the late B. Abbott, captain of the Cominco Ltd. H.B. mine rescue team in 1976 which won the Canadian Underground Mine Rescue Competition that year.

This competition was won by Blackdome Mining Corp. in 1988.

3. Safety Competitions

A. Small Mines

The West Kootenay Mine and Industrial Safety Association Trophy for Small Mines was donated in 1951 to encourage and promote safety in small mines. Since 1956, the competition has been open to qualifying mines throughout the province.

The award is given to the metal mine that has the lowest compensable accident rate after working from 2,500 to 30,000 shifts per year, at least one third of which were underground. The mine must have operated for at least nine months during the calender year. A fatality automatically disqualifies a mine for that year.

In 1988, the award was won by the Parson Barite mine which had 41 days lost time for a frequency of 13.98 days lost per 200,000 man-hours.

B. Open Pit Mines and Quarries

Trophies are awarded by the Ministry of Energy Mines and Petroleum Resources to those operations having the lowest compensable injury frequency rate.

1. The "A" trophy goes to operations having from 35,000 to 200,000 man-hours per year.

2. The "B" trophy goes to operations having from 200,000 to 1,000,000 man-hours in the year.

3. The "C" trophy, introduced in 1987, goes to operations that worked a minimum of 1,000,000 man-hours during the year.

In addition, since 1977 Certificates of Achievement have been awarded to operations amassing 15,000 man-hours without accidents over a continuous period not previously used to obtain an award.

In 1988, an awards presentation and dinner was held at the Hotel Vancouver, attended by 145 guests. The awards were presented by Doug Horswill, Deputy Minister, on behalf of the Honourable Jack Davis, Minister of Energy, Mines and Petroleum Resources. The banquet and proceedings were chaired by R.W. McGinn, Chief Inspector of Mines.

The following table shows the winners in 1988.

Open Pit Mines and Quarries Safety Award Winners, 1988

Award	Winner(s)
"A" Trophy	Westroc Industries Ltd. (Elkhorn Operation) Baymag Mine Ltd. Ash Grove Cement West Inc. (Blubber Bay Quarry) Pier Mac Sand and Gravel Jack Cewe Ltd. (Pipeline Road Quarry)
"B" Trophy	Bullmoose Operating Corp.
"C" Trophy	Quintette Coal Ltd.
Certificate of Achievement	Clayburn Industries Ltd. Nels Ostero Ltd. Valley Rite-Mix (Walmsly) Sechelt (RivTow) Blackhams Construction

4. First-aid Competitions

In 1976 a three-person first-aid team became the competitive standard, and the first Provincial Three-Persons Miners' First-Aid event was held in 1978. First-aid training is designed to aid a fellow worker in the event of an accident at the workplace; thus, the competition simulates this situation. One team member acts as the patient and the other two render first-aid. The St. John Standard course was adopted as the training standard and only those who work in or about a mine are permitted to enter.

In 1988, first-aid competitions were held by the East Kootenay, South/Central and North Mine Safety Associations. Winners went on to compete in a Provincial Competition.

Winners of the first-aid competitions in 1988 were as follows:

East Kootenay Mine and Industrial Safety Association:	Cominco Ltd. (Sullivan mine)
South/Central B.C. Mining Association:	B.H.P. Utah Mines Ltd. Teck Corp. (Afton mine)
North B.C. Mine Safety Association:	Quintette Coal Ltd. Placer Dome Inc. (Endako mine)

The Provincial winner was B.H.P. Utah Mines Ltd.

5. John T. Ryan Trophies

The John T. Ryan safety trophies were established in 1941 by the Mine Safety Appliance Company of Canada Limited to promote safety in Canadian metalliferous and coal mines. The administration of these annual awards is conducted by the Canadian Institute of Mining and Metallurgy.

There have been a number of changes in the regulations and qualifications over the years; however, there are now three categories open for annual competition.

1. Metalliferous Underground Mines - includes a Canadian trophy and four regional trophies. B.C. mines compete in the B.C. and Yukon Region.

2. Select Mines - includes open pit and strip mines for any mineral including coal. This has a Canadian trophy and two regional trophies. B.C. mines compete in the Western Region which includes all Canada west of the Manitoba-Ontario border.

3. Coal Mines - restricted to underground mines. There is a single Canadian trophy in this category.

Applications for these awards are submitted annually through the Chief Inspector of Mines. Awards are presented to the company or companies having the least number of compensable accidents in a continuous period in which 500,000 man-hours (120,000 for underground coal mines) of employment are recorded. If the 500,000 man-hours cannot be achieved in one year, they may be accumulated over a longer continuous time period but the complete calendar year must be included. No portion of that period may be used in another application for the same award. A fatality causes automatic disqualification for the period in which it occurs.

In 1988, the winners of these trophies were as follows:

Metalliferous Underground Mines, regional trophy: no trophy awarded.

Select Mines, regional trophy: International Minerals and Chemical Corporation (Canada) Limited, K1 Mine, Esterhazy, Saskatchewan.

There are no underground coal mines in British Columbia.

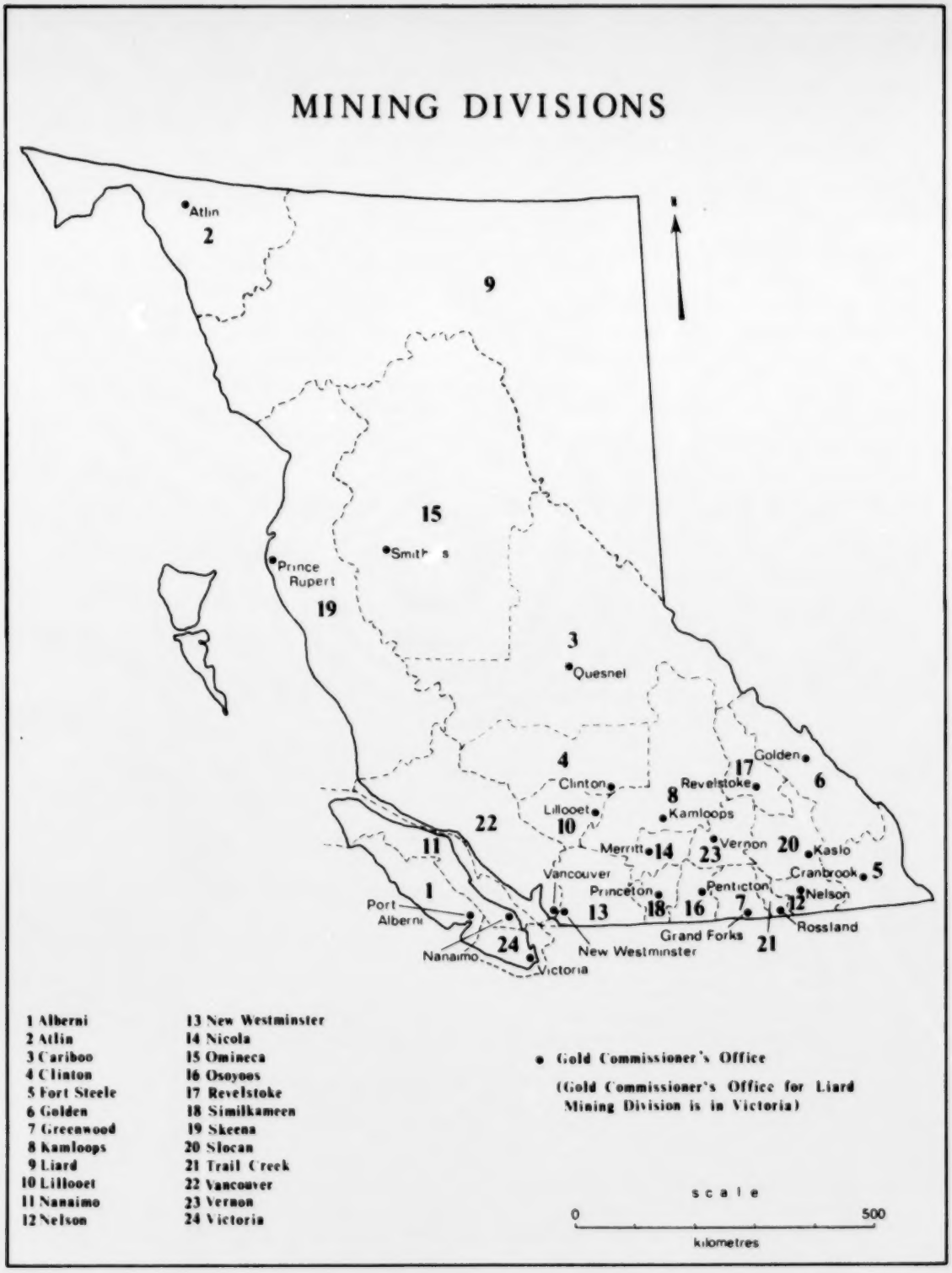

MINING DIVISIONS
Atlin
2
9
15
Smithers
Prince Rupert
19
3
Quesnel
4
Clinton
Golden
17
6
Revelstoke
8
Kamloops
Lillooet
22
10
11
Merritt
14
Vernon
23
20
Kaslo
5
Cranbrook
Vancouver
Princeton
Penticton
Nelson
1
13
18
16
7
12
Port Alberni
Grand Forks
Rossland
21
24
New Westminster
Nanaimo
Victoria
1 Alberni
2 Atlin
3 Cariboo
4 Clinton
5 Fort Steele
6 Golden
7 Greenwood
8 Kamloops
9 Liard
10 Lillooet
11 Nanaimo
12 Nelson
13 New Westminster
14 Nicola
15 Omineca
16 Osoyoos
17 Revelstoke
18 Similkameen
19 Skeena
20 Slocan
21 Trail Creek
22 Vancouver
23 Vernon
24 Victoria
• Gold Commissioner's Office
(Gold Commissioner's Office for Liard Mining Division is in Victoria)
scale
0
500
kilometres

Figure 2

PART 2 - MINE PRODUCTION

INTRODUCTION

Following the format used in previous editions of *Mining in British Columbia*, metal and coal mines are listed in alphabetical order by Mining Division, while industrial mineral mines are listed by commodity. The Mining Divisions are shown in Figure 2.

Property locations are given precisely by latitude and longitude, and the general geographic position by reference to an NTS map sheet. Figure 3 shows the location of all the metal mines described herein, and Figure 4 shows the location of coal mines. The properties are numbered sequentially as they appear in the text.

References are to publications of the Ministry and the Department of Mines, and to relevant articles in publications readily available in libraries. The notation MI refers to the Mineral Inventory, a continuing record (MINFILE) of hard-copy and computerized data relating to mineral properties in the Province. It is the basic data file which has been kept by the Ministry for over a century and which has been available to the public in its present form since 1977.

For more information on British Columbia metals and minerals markets, capital expenditure projects, production and employment, projects in review, exploration highlights, and advances in mineral land use or tenure policy, the Ministry of Energy, Mines and Petroleum Resources produces the quarterly *Mineral Market Update* which is distributed free of charge. For in-depth historical and current statistics covering all aspects of the mining industry, the Ministry also issues the publication *B.C. Mineral Statistics Annual Summary Tables* at nominal cost through Crown Publications Inc.

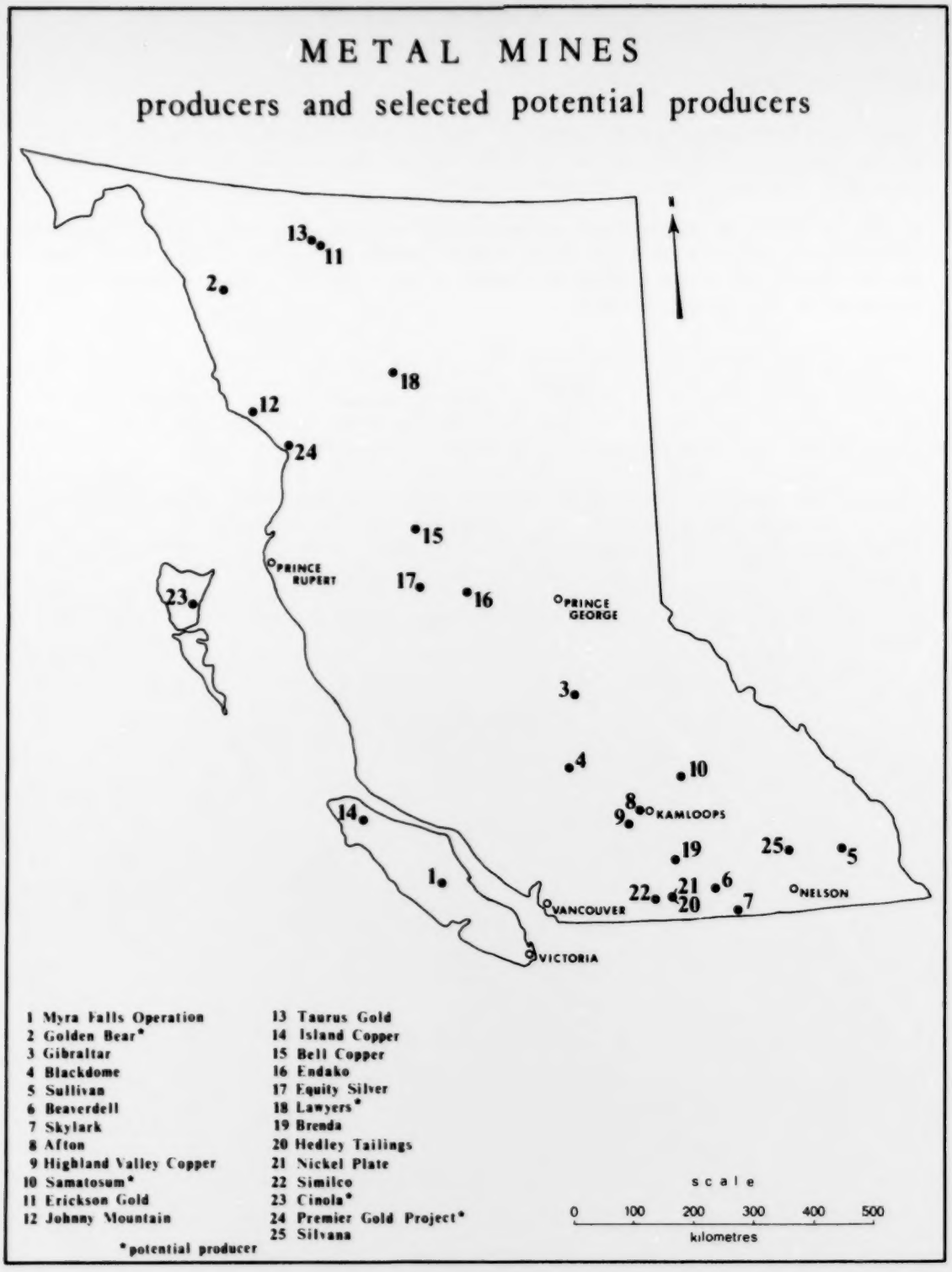

METAL MINES
producers and selected potential producers
N
PRINCE RUPERT
PRINCE GEORGE
KAMLOOPS
VANCOUVER
VICTORIA
NELSON
1 Myra Falls Operation
2 Golden Bear*
3 Gibraltar
4 Blackdome
5 Sullivan
6 Beaverdell
7 Skylark
8 Afton
9 Highland Valley Copper
10 Samatosum*
11 Erickson Gold
12 Johnny Mountain
13 Taurus Gold
14 Island Copper
15 Bell Copper
16 Endako
17 Equity Silver
18 Lawyers*
19 Brenda
20 Hedley Tailings
21 Nickel Plate
22 Similco
23 Cinola*
24 Premier Gold Project*
25 Silvana
*potential producer
scale
0 100 200 300 400 500
kilometres

Figure 3

METAL MINES

ALBERNI MINING DIVISION

MYRA FALLS OPERATION (Lynx, H-W)
(Fig.3, No.1)

Alberni M.D. Lat.49°34' Long.125°35' (92F/12E)

The Myra Falls Operation is located on the west side of the south end of Buttle Lake, 60 kilometres southwest of Campbell River, B.C. Access is via 88 kilometres of road from Campbell River.

The operation is owned by Westmin Resources Ltd., Suite 1800, Bow Valley Square III, 255-5th Avenue S.W., Calgary, Alberta, T2P 3G6.

The ore deposits consist of massive sulphides, including pyrite, chalcopyrite, sphalerite, and galena, occurring in volcanic rocks of the Sicker Group. The Lynx mine is within a single structural stratigraphic zone 400 to 500 metres thick, which has been traced over a strike length of 6,000 metres. The mine area comprises segments of a zone of rhyolite, other volcanic rocks, and ore. The H-W mine is at a stratigraphic level 100 metres lower. In this area, rocks ranging from massive volcanic rock to breccias, tuffs, and clastic sediments have been affected by dynamothermal metamorphism.

This is a large underground operation mining copper, zinc, lead, gold and silver, which first came into production in 1967. Four separate underground mines have existed at this site: the Myra, Price, Lynx and H-W mines. Only the Lynx and H-W mines are now producing with current reserves at 300,000 tonnes and 11.6 million tonnes respectively.

The mine, mill and plant expansion program, which began in April, 1987, neared completion in 1988. The expanded mill now has a capacity of 4000 tonnes/day; however, the underground development fell behind schedule. Ore mined from the H-W mine increased to 1,135,619 tonnes, up from 898,242 tonnes in 1987, whereas production from the Lynx mine fell to 119,505 tonnes from 191,554 tonnes in 1987. The decline at the Lynx mine was due to the decreased number of production workings, but further underground development is continuing. The milling rate averaged 3,467 tonnes/day.

In October, 1988, the Thelwood hydro unit became inoperable due to the cave-in of a tunnel. Restoration of the tunnel is underway, with power being temporarily supplemented by additional diesel units. Field tests began on a laboratory developed process to control acid generation from waste rock.

References:

B.C. Minister of Mines. Annual Report, 1964, pp.157-166.

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, Vol.1, 1975-1980, pp.1-2.

_____. Mining in British Columbia, 1981-1985, p.2.

_____. Mining in British Columbia, 1986-1987, p.44-45.

C.I.M. Bull., Dec. 1980, pp.71-90.

MI 92F-71, 72, 73.

MYRA FALLS OPERATION (Lynx, H-W)

	1987	1988
Ore Shipped or Treated (t)	1 089 796	1 255 124
Product Shipped		
Copper concentrates (t)	100 246	120 159
Zinc concentrates (t)	86 508	96 640
Gross Metal Content		
Gold (g)	1 322 033	1 469 107
Silver (g)	31 757 428	34 875 293
Copper (Kg)	25 145 000	26 858 000
Lead (Kg)	3 371 000	99 000
Zinc (Kg)	47 581 000	45 385 000

ATLIN MINING DIVISION

GOLDEN BEAR
(Fig.3, No.2)

Atlin M.D. Lat.58°13' Long.132°18' (104K/01W)

This property is located 140 kilometres west of Dease Lake, B.C. and 290 kilometres northwest of Stewart, B.C.

The operation is owned by North American Metals (B.C.) Inc., 1020-800 West Pender Street, Vancouver, B.C., V6C 2V6.

This is a replacement ore body. Gold occurs in silicified and breccia zones along a major fault between Permian limestones and upper Triassic andesites.

In 1988, the 140 kilometre access road reached the site, and construction began on a permanent camp and plant foundations. In addition, the airstrip and roads on the property were upgraded and further drilling took place. Start-up at the mine is planned for late 1989, producing gold and silver at a milling rate of 350 tonnes/day and employing about 100 persons. Mine life is estimated at a minimum of 5.5 years, with reserves of 1.63 Mt at 11.0g/t Au.

References: MI 104KO79

CARIBOO MINING DIVISION

GIBRALTAR
(Fig.3, No.3)

Cariboo M.D. Lat.52°30' Long.122°16' (93B/9W)

The property is located approximately 161 kilometres south of Prince George, B.C., and 16 kilometres east of McLeese Lake, B.C., on the west side of Granite Mountain by Granite Creek. Access is via a paved road which connects to Highway 97 at McLeese Lake.

The operation is 68.1% owned by Placer Dome Inc., Gibraltar Mine Division, P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

The ore zone is a porphyry copper-rich deposit, occurring within a Triassic pluton of variable composition. The mine phase, which contains the ore zone, is a quartz diorite that has been altered and deformed. Mineralization took place during a complex history of deformation which involved the folding of mineralized foliations. Four orebodies are known: Gibraltar East, Gibraltar West, Granite Lake, and Pollyanna. Ore minerals are chalcopyrite and molybdenite; however, the Gibraltar East and Pollyanna pits have well-defined zones containing supergene chalcocite.

This is a large open-pit copper operation that first began production in 1972. The mine was closed from May 11 to November 28, 1988 due to a strike, resulting in a 50% reduction in copper production. The cathode copper plant, which came on-stream in 1986, continued to operate throughout the strike using material from low-grade dumps. The prevailing high selling price of copper by year end has substantially helped this operation.

References:

B.C. Ministry of Energy, Mines & Pet. Res. G.E.M., 1973, pp.299-318.
_____. Mining in British Columbia, Vol.1, 1975-1980, pp.3-4.
_____. Mining in British Columbia, 1981-1985, pp.3-4.
_____. Mining in British Columbia, 1986-1987, pp.45-46.
MI 93B-6, 7, 12, 13.

GIBRALTAR

	1987	1988
Ore Shipped or Treated (t)	12 575 334	5 473 121
Product Shipped		
Copper concentrates (t)	101 587	49 535
Copper cathode (t)	3 972	5 035
Molybdic oxide (t)	408	219
Gross Metal Content		
Gold (g)	26 936	15 272
Silver (g)	3 972 132	1 632 994
Copper (Kg)	35 428 740	17 925 750
Molybdenum (Kg)	449 478	357 229

CLINTON MINING DIVISION

BLACKDOME
(Fig.3, No.4)

Clinton M.D. Lat.51°20' Long.122°29' (92O/8W)

The property is located near the peak of Blackdome Mountain, 70 kilometres northwest of Clinton, B.C. Access is via road off Highway 97, crossing the Fraser River near Gang Ranch.

The mine is owned by Blackdome Mining Corporation, 852-409 Granville Street, Vancouver, B.C., V6C 1T2.

The deposits occur within a gently dipping sequence of Tertiary volcanic and volcanoclastic formations, transected by steeply dipping northeast-trending normal faults. The fault zones have provided channels for epithermal mineralization, and contain variable amounts of gouge, clay alteration, silicification, and gold-silver bearing quartz veining. The mineralized volcanics are overlain by younger basalts which form the crest of Blackdome Mountain. Gold and silver mineralization usually consists of less than one percent dissemination of fine- to medium-grained electrum, acanthite, tetrahedrite, friebergite, chalcopyrite, pyrite, and silver sulphosalts. Quartz veining occurs as multiple stringers and stockworks up to six metres in width, and single veins up to three metres in width.

This gold/silver operation opened in May, 1986, and now produces 200-250 tonnes of ore per day which is transported to the mill and processed into a dore gold product. Most ore is produced from four underground levels, while some 5-10% of the mill feed comes from the open pit. In 1988, mill throughput was 87,519 tonnes.

During the year a major exploration program was conducted, encompassing surface and underground geological mapping, 28,543 metres of diamond drilling, 1,285 metres of exploration drifting and raising, and a multi-parameter airborne survey.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.4-5.
_____. Mining in British Columbia, 1986-1987, p.47-48.

MI 920-51

BLACKDOME

	1987	1988
Ore Shipped or Treated (t)	74 001	79 396
Product Shipped		
Flotation concentrates (t)	422	599
Refinery slag (t)	54	
Gross Metal Content		
Gold (g)	1 451 421	1 708 328
Silver (g)	3 929 689	6 514 686

FORT STEELE MINING DIVISION

SULLIVAN
(Fig.3, No.5)

Fort Steele M.D. Lat.49°45' Long.116°00' (82F/9E; 82G/12W)

The Sullivan mine and concentrator are located within the city limits of Kimberley, B.C. The mine is on Mark Creek, 3.2 kilometres north of the city centre, and the concentrator is 3.2 kilometres south of the city centre.

The operation is owned by Cominco Ltd., 200 Granville Street, Vancouver, B.C., V6C 2R2.

This deposit is a hydrothermal synsedimentary occurrence in the Aldridge Formation. The orebody is a large, lens-like body lying on the east limb of a north-plunging anticline and measuring from a few feet to 300' in thickness. The base is massive pyrrhotite which is overlain by conformable layers of generally well-laminated sulphides separated by clastic (silty) rocks. The western part of the deposit is more massive than the eastern part as the sulphide layers become thinner to the east. The main sulphides are pyrrhotite, sphalerite, galena, and pyrite. Chalcopyrite and arsenopyrite are minor constituents as well as some boulangerite, magnetite and cassiterite. In general, metal distribution is zoned, with higher lead content at the core and zinc in the east.

This lead, zinc, silver mine commenced production in 1923. The operation has both underground and open-pit mining; however, the open pit has been inactive since 1983. Ore production is mainly from pillar recovery operations, with ore extraction from slusher sublevels or mechanized drawpoints. Reserves for the mine are 24,700,000 tonnes.

The mine operated throughout 1988 with no shutdowns. During the year, a detailed monitoring program was initiated to measure caving and subsidence activity over mined out areas. A 30,000 ft^2 surface maintenance shop was constructed to consolidate shop facilities. In addition, an expansion and modernization of the flotation circuits at the concentrator was completed in August.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, Vol.1, 1975-1980, pp.5-6.

_____. Mining in British Columbia, 1981-1985, p.5.

_____. Mining in British Columbia, 1986-1987, p.48-49.

MI 82F/NE-52.

SULLIVAN

	1987	1988
Ore Shipped or Treated (t)	1 686 600	2 038 163
Product Shipped		
Lead concentrates (t)	98 048	154 333
Zinc concentrates (t)	130 919	306 178
Gross Metal Content		
Silver (g)	70 836 084	95 243 201
Lead (Kg)	68 549 627	105 006 620
Zinc (Kg)	64 586 155	102 488 460

GREENWOOD MINING DIVISION

BEAVERDELL (Highland Bell)
(Fig.3, No.6)

Greenwood M.D. Lat.49°26' Long.119°04' (82E/6E)

The mine is situated on Wallace Mountain immediately east of Beaverdell, B.C., and 60 kilometres south of Kelowna, B.C.. The mill and tailings pond are located on the west side of the West Kettle River, and the concentrator is on the flat below Beaverdell.

The mine is owned by Teck Corporation, 1199 West Hastings Street, Vancouver, B.C., V6E 2K5.

The ore is contained in highly fractured and faulted quartz and calcite veins. These veins are found in a large body of quartz diorite which extends into the sedimentary Wallace formation to the east. The veins contain galena, sphalerite, chalcopyrite and pyrrhotite, with occurrences of pyrargyrite and native silver. The mineralization may extend for short distances into the wall rock where it has been altered.

This underground mine is one of the oldest in the district having produced silver ore, almost without interruption, since 1916. The ore is mined by open stoping methods using conventional narrow vein mining methods. Broken ore is trammed to the surface bins then trucked to the mill. After crushing and grinding, concentration is carried out to produce a jig concentrate and two flotation concentrates which are transported by truck to the smelter at Trail, B.C. Mill throughput in 1988 was 104 tonnes/day.

References:

B.C. Minister of Mines. Annual Report 1949, pp.145-148.

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.8.

_____. Mining in British Columbia, 1981-1985, p.6.

_____. Mining in British Columbia, 1986-1987, p.49-50.

MI 82E/SW-30, 72, 133.

BEAVERDELL (Highland Bell)

	1987	1988
Ore Shipped or Treated (t)	36 352	37 262
Product Shipped		
Lead concentrates (t)	420	361
Zinc concentrates (t)	196	178
Jig concentrates (t)	200	211
Gross Metal Content		
Gold (g)	9 331	7 060
Silver (g)	10 831 506	11 001 891
Copper (Kg)	1 572	689
Lead (Kg)	132 444	124 274
Zinc (Kg)	152 257	128 038

SKYLARK (O.B.)
(Fig.3, No.7)

Greenwood M.D. Lat.49°05' Long.118°37' (NTS 82E/2E)

The property is located five kilometres east of Greenwood, B.C.

The mine is majority-owned and operated by Skylark Resources Ltd., 902-837 West Hastings Street, Vancouver, B.C., V6C 1B6.

Geology consists of an andesite and latite sequence overlain by argillites and capped by a banded chert. Grandiorite of the Greenwood Stock intrudes this sequence. The Skylark vein occurs in a zone of intense silification and carbonization, and is cut by quartz and calcite stringers. The stringers host varying amounts of galena, sphalerite, tetrahedrite, arsenopyrite, stibnite, ruby silver, and pyrite. Reserves at the Skylark property are estimated at 54,500 tonnes.

In 1986 the first phase of underground development was completed, with pre-production in 1987. The operation commenced production in April, 1988, shipping 140 tonnes per day to the Dankoe mill at Keremeos where it was milled at a rate of 110 tonnes per day. During 1988, ore shipments graded 924.5 grams per tonne silver and 3.4 grams per tonne gold. The company plans to increase shipments to 200 tonnes per day.

References:

Canadian Mines Handbook, 1988-1989
MI 082ESE011

SKYLARK (O.B.) MINE

	1987	1988
Ore Shipped or Treated (t)		21 591
Product Shipped		
Lead/Silver concentrates (t)		914
Gross Metal Content		
Gold (g)		51 103
Silver (g)		8 835 005
Copper (Kg)		6 346
Lead (Kg)		81 672
Zinc (Kg)		5 063

KAMLOOPS MINING DIVISION

AFTON
(Fig.3, No.8)

Kamloops M.D. Lat.50°39' Long.120°30' (92I/10E; 92I/9W)

The Afton mine is alongside the Trans-Canada Highway, 13 kilometres west of Kamloops, B.C., at 640 metres elevation.

The mine is owned by Teck Corporation (73%), 1199 West Hastings Street, Vancouver, B.C., V6E 2K5.

The Pothook deposit consists mainly of chalcopyrite with chalcocite, bornite and native copper. The Crescent deposit is on the northern contact of the Iron Mask Batholith and consists mainly of chalcopyrite, occurring as blebs and disseminations. The Ajax deposit lies at the southern contact of the Iron Mask Batholith as a multi-unit intrusive body. Copper mineralization is associated with the Sugarloaf Diorite, a younger intrusive phase typically of fine-medium grained porphyritic diorite. Chalcopyrite is the predominant copper mineral and the only one of economic significance. It occurs as blebs and disseminations, in fractures, veinlets and microveinlets, and occasionally in breccias and vugs with accompanying calcite. Gold mineralization is closely associated with chalcopyrite mineralization.

The Afton mine is a large open pit copper operation which came into production in 1977. Mining at the original Afton pit ceased in July, 1987 at which time the Pothook pit, located two kilometres southwest of the plant site, was brought into production. This pit was mined until October, 1988 when reserves were exhausted and the Crescent pit, located three kilometres east of the plant site, was brought into production. During 1988, a proposal to mine the Ajax deposit was submitted to the Mine Development Review Process. The new Ajax mine, located ten kilometres southeast of the mill, is scheduled to begin production in mid-1989. Until production from the Ajax property commences, ore from the Crescent pit and from low grade stockpiles will be used, which should maintain production levels throughout that period.

The decision to place the Ajax deposit into production will extend the life of the Afton operation by seven to eight years at a milling rate of 10,000 tonnes/day.

References:

B.C. Ministry of Energy, Mines & Pet. Res. G.E.M., 1972, pp.209-220.

_____. Mining in British Columbia, 1975-1980, Vol. 1, pp.11-12.

_____. Mining in British Columbia, 1981-1985, p.7.

_____. Mining in British Columbia, 1986-1987, p.50-51.

C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.376-387.

MI 92I/NE-23,26,30.

AFTON

	1987	1988
Ore Shipped or Treated (t)	2 861 570	3 094 452
Product Shipped		
Copper concentrates (t)	50 214	22 947
Gross Metal Content		
Gold (g)	1 496 295	1 004 518
Silver (g)	8 391 625	2 750 791
Copper (Kg)	19 805 639	7 710 706

HIGHLAND VALLEY COPPER
(Fig.3, No.9)

Kamloops M.D. Lat.50°29' Long.121°02' (92I/6E)

The property is located in the Highland Valley, 15 kilometres west of Logan Lake, B.C. It is accessed by highway from Ashcroft, Kamloops, and Merritt, B.C.

The mine is operated by Highland Valley Copper, P.O. Box 10024, Pacific Centre, 3000-700 West Georgia Street, Vancouver, B.C., V7Y 1A1, a partnership of Cominco, Rio Algom Ltd., Teck Corporation and the Highmont Mining Company.

The mine is situated in the central core of the Upper Triassic Guichon Creek batholith, which consists of several intrusive phases and varieties of calc-alkaline igneous rocks. The youngest phase (Bethsaida) is the host rock and is porphyritic granodiorite, medium- to coarse-grained, with coarse phenocrysts of quartz and biotite. The main sulphide minerals are bornite and chalcopyrite which are associated with a quartz-sericite stockwork system, as well as sericite-rich alteration zones. Pyrite and molybdenite form a weak halo around the edge of the orebody, and a relatively narrow oxide zone occurs in the upper portion of the orebody.

The operation is an amalgamation of the Valley Copper (1983), Highmont (1980), Lornex (1972) and Bethlehem (1962) operations, and as such constitutes one of the largest open-pit copper mines in the world. During 1988, the average mill throughput was 91,400 tonnes/day at the Lornex mill and 29,100 tonnes/day at the Bethlehem mill; during the year, several operating records were set.

In January 1988, Highland Valley Copper acquired the nearby Highmont mill. In February, a plan was announced to relocate the facilities to a site adjacent to the Lornex milling complex, a distance of about ten kilometres. This major project is scheduled for completion in early 1989, bringing the total milling capacity at the Lornex complex to 131,000 tonnes/day. Operation of the Bethlehem mill is expected to be phased out when the expanded Lornex plant is fully operational.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.8-9 (Lornex) and pp.9-10 (Valley Copper).

_____. Mining in British Columbia, 1986-1987, p.51-52.

MI 92I/SW12.

HIGHLAND VALLEY COPPER

	1987	1988
Ore Shipped or Treated (t)	41 999 458	40 015 463
Product Shipped		
Copper concentrates (t)	398 755	388 970
Molybdenite concentrates (t)	4 741	
Molybdic oxide (t)		1 819
Molybdenum sulphide (t)		1 507
Gross Metal Content		
Gold (g)	296 416	597 529
Silver (g)	46 366 979	66 399 175
Copper (Kg)	161 897 636	175 501 685
Molybdenum (kg)		1 939 262

SAMATOSUM
(Fig.3, No.10)

Kamloops M.D. Lat.51°10' Long.119°47' (82M/4W)

The property is located on Samatosum Mountain near the town of Barriere, about 100 kilometres north of Kamloops, B.C. It is accessed by 39 kilometres of road from Barriere, via the Agate Bay road.

The project is owned by Minnova Inc., Suite 3970, P.O. Box 91, Commerce Court West, Toronto, Ontario, M5L 1C7 (70%) and Rea Corporation, World Trade Centre, 536-999 Canada Place, Vancouver, B.C., V6C 3E1 (30%).

The deposit lies within the Eagle Bay Assemblage of strongly foliated and overturned Paleozoic rocks in association with mafic pyroclastics, sericitic tuffs, cherts, muddy tuffs and sediments. The Muddy Tuff unit is often well mineralized with up to 60% pyrite, minor zinc-lead-copper, and up to 60g/tonne silver over thicknesses of 10-15 metres. Much of the orebody is a stratabound quartz vein, with lesser portions of mineralized and altered wall rock materials. The flat, plunging, tabular orebody averages approximately six metres in thickness and is 500 metres long by 80 metres high. Economic mineralization consists of tetrahedrite, the principal silver mineral, sphalerite, galena, chalcopyrite and electrum.

This operation is a potential gold/silver producer. During the first half of 1988, activities focussed on a feasibility study and preparation of a Stage I Report. The Report was approved, and Approval-in-Principle granted, by November, 1988. By year end development had begun, with construction of the mine access road, plant site, tailings dam, building foundations and other related facilities underway.

Production is scheduled to begin in late 1989 at a rate of 154,000 tonnes/year with a work force of 96 persons. Mining will initially be by open-pit methods, but may change to underground as economics dictate. Milling will be by conventional flotation methods to produce a silver-copper concentrate, a zinc concentrate and a lead concentrate.

References: MI 82M-244.

LIARD MINING DIVISION

ERICKSON GOLD
(Fig.3, No.11)

Liard M.D. Lat.59°13.5' Long.129°39' (104P/4E)

The property is located 12 kilometres southeast of Cassiar, B.C., adjacent to McDame Lake.

The mine is owned and operated by Total Energold Corporation, 1500-700 West Pender Street, Vancouver, B.C., V6C 1G8.

This is a mesothermal volcanic-hosted multi-vein type underground mine. Gold and silver values in the Jennie quartz vein are contained in metallic gold, pyrite, tetrahedrite, chalcopyrite, and small amounts of galena and sphalerite. The vein is from a few centimetres to nine metres wide, with an average of one metre. Enclosing rocks are interbedded volcanic and sedimentary. A fine-grained dyke parallels the vein. In the southern part of the property the main mineralization occurs in quartz veins of varying width, length, and grade, which generally follow steeply dipping faults. The veins contain occasional coarse, visible gold, minor tetrahedrite, galena, pyrite, and siderite, and are frequently accompanied by a mariposite wallrock alteration. Minor gold values have also been reported from sulphide stringers and chert breccia zones.

This underground gold mine went into production in December, 1978. Mining methods used include shrinkage stope, modified room and pillar and selective open-pit methods. In October 1988, a 2.5 kilometre exploration cross-cut was commenced to access high grade reserves. The adit and associated underground drilling should be completed by early 1990. On November 7, 1988, production was suspended as accessible reserves were mined out, but the mill was expected to re-open in 1990.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.15.
_____. Mining in British Columbia, 1981-1985, p.10.
_____. Mining in British Columbia, 1986-1987, p.52-53.
MI 104P-29.

ERICKSON GOLD

	1987	1988
Ore Shipped or Treated (t)	86 346	71 894
Product Shipped		
Gold concentrates (t)	2 193	2 686
Jig concentrates (t)		3
Gross Metal Content		
Gold (g)	1 143 026	517 046
Silver (g)	523 190	645 328

JOHNNY MOUNTAIN
(Fig.3, No.12)

Liard M.D. Lat.56°38' Long.131°04' (104B/11E)

The property is located 280 kilometres north of Terrace, B.C., on the northwest slope of Johnny Mountain. Access is by air only.

The mine is owned by Skyline Gold Corporation (formerly Skyline Explorations Ltd.), 301-675 West Hastings Street, Vancouver, B.C., V6B 1N2.

Visible native gold is common and is the main economic mineral. Associated minerals include pyrite, chalcopyrite and some sphalerite and galena. Quartz and microcline are the main gangue components of the veins. Mineralization is localized in at least three significant vein systems which represent staged, high temperature deposition related to syenitic plutonism of early Lower Jurassic age.

Pre-production mine development began in 1987, when the construction of the mill and related surface structures was commenced. Since 1987, efforts concentrated on underground development and stope preparation. Production commenced in August, 1988, making this the first producer in the Iskut River region of B.C.

The operation produces gold dore bars and a copper concentrate containing gold and silver. Gold production is planned at an annual rate of approximately 1.7 million grams, while 2.8 million grams of silver and 585,000 kgs of copper will be produced annually as by-products.

During 1988, the mill process was modified by removing the cyanide circuit and recovering gold as a gravity concentrate. In addition, the mining method was changed to reduce dilution. Consistent monthly production increases were achieved following start-up. By year end, production was approaching the target of 150,000 grams gold/month and the mill reached a throughput of 240 tonnes/day.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.53.
MI 104B-107

JOHNNY MOUNTAIN

	1987	1988
Ore Shipped or Treated (t)		24 250
Product Shipped		
Gold bullion		
Copper concentrates (t)		725
Gross Metal Content		
Gold (g)		146 856
Silver (g)		122 100
Copper (kg)		17 090

TAURUS GOLD
(Fig.3, No.13)

Liard M.D. Lat.59°16' Long.129°42' (104P/5E)

The property is located 9.6 kilometres southeast of Cassiar, B.C., and about four kilometres west of Highway 37. It is accessed via seven kilometres of road off Highway 37.

The mine is owned by Taurus Resources Ltd., 1110-625 Howe Street, Vancouver, B.C., V0C 1E0.

The ore minerals are contained in quartz veins and include free gold, auriferous pyrite, tetrahedrite, chalcopyrite, and minor amounts of galena and sphalerite. The veins vary from a few centimetres to one metre in width. The enclosing rocks are interbedded volcanics and sedimentaries.

Mine and mill production began in 1981 using underground shrinkage stoping mining methods. After producing throughout 1986 and 1987, mining was suspended in March, 1988. Large bulk samples were processed from the Hopeful zone, but the mill was closed in December while possible new ore sources were being assessed.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.11.
_____. Mining in British Columbia, 1986-1987, pp.53-54.
MI 104P-12.

TAURUS GOLD

	1987	1988
Ore Shipped or Treated (t)	37,552	4 398
Product Shipped		
Flotation (t)	566	
Cathode concentrate (t)	440	3 596
Jig (N/A 1987)		4 319
Gross Metal Content		
Gold (g)	91,519	4 792

NANAIMO MINING DIVISION

ISLAND COPPER
(Fig.3, No.14)

Nanaimo M.D. Lat.50°36' Long.127°28' (92L/11W,12E)

The property is located on Vancouver Island, 16 kilometres south of Port Hardy, B.C., and eight kilometres east of Coal Harbour, B.C., on the north shore of Rupert Inlet. It is accessed by road from Port Hardy.

The mine is owned by BHP-Utah Minerals International Inc., 550 California Street, San Francisco, California, 94104.

The orebody is an elongated ellipse, subparallel to the regional trend. It occurs within rocks of the Bonanza Group, including coarse to fine andesitic to dacite breccias and tuffs. Intrusive into the volcanic rocks is an irregular dyke of quartz-feldspar porphyry which dips at 45°-60° to the north. The orebody is draped about the dyke. The ore zone is strongly fractured, with chalcopyrite and molybdenite occurring in veinlets. About 75% of the ore is in volcanic rocks and the remainder, on both sides of the dyke, is in marginal breccia.

Production began from this open-pit mine in late 1971. Copper concentrate is shipped to smelters in Japan, while molybdenum concentrate is dried, packaged into steel drums and trucked to Vancouver. Shipments to overseas markets are made through an adjacent port facility on Rupert Island.

In 1988, operations continued at the full production rate of approximately 45,000 tonnes/day. The decision to push back the south wall of the pit to access additional reserves is still pending, as exploration for new reserves on the mine property continued.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, pp.16-17.

_____. Mining in British Columbia, 1981-1985, p.12.

_____. Mining in British Columbia, 1986-1987, p.54-55.

C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.206-218.

MI 92F-62,99,135.

ISLAND COPPER

	1987	1988
Ore Shipped or Treated (t)	18 837 431	16 703 942
Product Shipped		
Copper concentrates (t)	222 193	238 784
Molybdenite concentrates (t)3,194	4,330	
Gross Metal Content		
Gold (g)	1 401 616	1 394 152
Silver (g)	12 896 064	13 411 539
Copper (Kg)	56 964 532	64 055 889
Molybdenum (Kg)	1 503 310	1 972 403

OMINECA MINING DIVISION

BELL COPPER
(Fig.3, No.15)

Omineca M.D. Lat.55°00' Long.126°14' (93M/1E; 93L/16)

The property is located at the north end of the Newman Peninsula on Babine Lake, approximately 70 kilometres northeast of Smithers, B.C., and 16 kilometres north of Granisle, B.C.

The mine is owned by Noranda Inc., P.O. Box 45, Commerce Court West, Toronto, Ontario, M5L 1B6.

The Bell orebody is an elliptical intrusion of biotite feldspar porphyry, 730 by 365 metres in size. Copper mineralization occurs overlapping the western and northern contacts of the stock, giving the deposit a crescent shape. The sediments and volcanics are generally hornfelsed, and all units have undergone intense hydrothermal alteration. The mineralization is primarily chalcopyrite which occurs in a dense quartz stockwork as disseminations and fracture fillings. Pyrite forms from eight to fifteen per cent of the rock in the ore zone. Also, a zone of supergene enrichment exists, with chalcocite common as much as 60 metres below the surface. Assorted copper oxides and carbonates make up five to ten per cent of the total copper content of the upper part of the deposit. Minor amounts of gold and silver are associated with the chalcopyrite.

The Bell Copper operation commenced production in 1972. The mine, which uses conventional open-pit methods, operated on a steady basis throughout 1988, producing 15,000 tonnes of ore per day. The mill operated at a rate of 14,760 tonnes/day. Noranda has spent approximately $13 million on exploration over two years and delineated nine million tonnes of additional ore. An expansion of the pit limits was evaluated and approved, to enable continuing operations until late 1991.

References:

B.C. Minister of Mines. Annual Report 1965, pp.99-102.

B.C. Ministry of Energy, Mines & Pet. Res. G.E.M.: 1969, p.114.; 1970, p.170; 1971, pp.185-186;
1972, pp.426-428; 1973, pp.352-353; 1974, p.266.

_____. Mining in British Columbia, 1975-1980, Vol.1, pp.21-22.

_____. Mining in British Columbia, 1981-1985, p.15.

_____. Mining in British Columbia, 1986-1987, p.56-57.

MI 93M-1.

BELL COPPER

	1987	1988
Ore Shipped or Treated (t)	5 409 541	5 367 338
Product Shipped (t)		
Copper concentrates (t)	88 910	80 488
Gross Metal Content		
Gold (g)	892 514	871 364
Silver (g)	3 856 147	3 161 606
Copper (Kg)	23 396 427	22 632 003

ENDAKO
(Fig.3, No.16)

Omineca M.D. Lat.54°02' Long.125°07' (93K/3E)

The property is located ten kilometres southwest of Endako, B.C., and 160 kilometres west of Prince George, B.C., north of the east end of Franois Lake. Access is via paved road from Highway 16 just east of Endako.

The mine is owned by Placer Dome Inc., Endako Mines Division, P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

This is an irregular and elongated orebody in Endako quartz monzonite, part of the Topley intrusions of Jurassic age. There has been pervasive kaolinization of the Endako quartz monzonite, which is intruded by a variety of premineral dykes and by postmineral basalt dykes. Molybdenite, pyrite, magnetite, and chalcopyrite are closely associated with quartz in veins and fracture fillings. Ore minerals occur in major quartz-molybdenum veins 15 centimetres to one metre wide.

This open-pit molybdenum mine, which commenced production in 1965, uses truck and shovel methods. In 1988, six 120-tonne diesel/electric trucks were added to the fleet. The preparation plant produces molybdenum disulphide which is either refined for the manufacture of oils and greases, or roasted to produce molybdenum trioxide which is used in steel manufacturing.

The mine and mill were shut down from June, 1982 to August, 1986, due to decreases in product price and depressed markets. Since re-opening, daily mill tonnages increased in stages, with operations reaching full capacity in October, 1988. In December, work was completed on a $2.25 million expansion which doubled the size of the production plant for lubricant-grade molybdenum.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.23.
_____. Mining in British Columbia, 1981-1985, p.16.
_____. Mining in British Columbia, 1986-1987, p.57-58.
C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.444-454.
MI 93K-6.

ENDAKO

	1987	1988
Ore Shipped or Treated (t)	4 716 500	7 549 200
Product Shipped*		
Molybdenite concentrates (t)	219	
Molybdic oxide (t)	3 409	4 536
Ferro-molybdenum (t)	277	
Ammonium Di-molybdate (t)	195	
Molybdenum sulphide (t)	109	5 018
Ultrapure (t)		202
Other Molybdenum products (t)		466
Gross Metal Content		
Molybdenum (Kg)	4 209 218	5 287 316

* Note changed product categories.

EQUITY SILVER
(Fig.3, No.17)

Omineca M.D. Lat.54°11' Long.126°16' (93L/1W)

The property is located 40 kilometres southeast of Houston, B.C., and approximately 15 kilometres north of François Lake.

The operation is 58.8% owned by Placer Dome Inc., P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

The ore zone is within a west-dipping dacitic volcanic pile of Mesozoic age. The Mesozoic rocks are intruded on the east by a Tertiary syenomonzonite stock. The base of the mine section is quartz pebble conglomerate, above which is a layer of dacite pyroclastic breccia. Silver-copper mineralization, in the form of tetrahedrite and chalcopyrite, occurs in 5-100 metre wide shear and breccia zones, within host alphanitic, brittle tuffaceous rock. Accessory sulphides associated with the ore-bearing minerals are pyrite, galena, sphalerite and arsenopyrite.

This is an open-pit mine producing silver, gold and copper concentrates which went into operation in 1980 using conventional open-pit methods. The mine operated continuously throughout 1988 at a rate of 30,000 tonnes per day and the mill processed 8500-9000 tonnes/day.

Considerable resources were devoted to developing a decommissioning and closure plan to address the very significant acid mine drainage problem at the site. The plan was being reviewed by a number of government agencies at year end.

References:

B.C. Ministry of Energy, Mines & Pet. Res. G.E.M.: 1969, p.150; 1970, p.126; 1971, p.168.
_____. Mining in British Columbia, 1975-1980, Vol.1, pp.24-25.
_____. Mining in British Columbia, 1981-1985, p.16.
_____. Mining in British Columbia, 1986-1987, p.58-59.
MI 93L-1.

EQUITY SILVER

	1987	1988
Ore Shipped or Treated (t)	3 610 050	3 228 212
Product Shipped (t)		
Copper-silver-gold concentrates (t)	40 076	42 562
Gold concentrates (t)	1 216	
Dore (1988)		
Gross Metal Content		
Gold (g)	1 221 310	1 490 479
Silver (g)	156 079 319	183 393 471
Copper (Kg)	6 041 368	6 879 299

LAWYERS
(Fig.3, No.18)

Omineca M.D. Lat.57°20' Long.127°12' (94E/6)

The property is located approximately 280 kilometres north of Smithers, B.C., in the Toodoggone River area. Access is via the Omineca Mining Access Road which extends northwest from Moosedale to the mine site.

The operation is owned by Cheni Gold Mines Inc., Box 11175, Royal Centre, 1055 West Georgia Street, Vancouver, B.C., V6E 3R5.

The eastern part of the property is underlain by quartz-andesite-crystal-lapilli-tuff which represents the remnant of a paleo-horst. The western part is underlain by volcano-sedimentary rocks of trachytic source, which represent a graben basin. Several gold-silver showings have been located, all associated with silicified filling of reactivated faults and fractures along the paleo-grabel margins. The three most promising showings (the Amethyst Gold Breccia Zone, the Cliff Creek Breccia Zone, and the Duke's Ridge Zone) are all within, or near, the area of trachyte volcanism deposited west of the paleo-horst.

In 1987, an access road to the property was completed and mine development commenced. Construction continued for most of 1988. Initial production and mill commissioning was in progress by year end, with commercial production targeted for early 1989 at a rate of 500 tonnes/day. The mine is expected to produce approximately 1.2 million grams of gold and 28 million grams of silver during the first seven years of operation.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.17-18.

_____. Mining in British Columbia, 1986-1987, p.59-60.

MI 94E-66.

OSOYOOS MINING DIVISION

BRENDA
(Fig.3, No.19)

Osoyoos M.D. Lat.49°53' Long.120°00' (92H/16E)

The Brenda mine operations are situated 22 kilometres northwest of Peachland, B.C., and 2.5 kilometres southwest of Brenda Lake. Access is via 29 kilometres of road (19 kilometres paved and ten kilometres gravel) from Peachland.

The mine is owned by Brenda Mines Ltd., P.O. Box 420, Peachland, B.C., V0H 1X0

The orebody is within the Brenda Stock, a composite quartz diorite to granodiorite body of Jurassic age which intrudes rocks of the Upper Triassic Nicola Group. It is cut by pre-ore and post-ore dykes of divergent composition. Mineralization is confined almost entirely to veins, most of which are quartz veins. Chalcopyrite and molybdenite are the main sulphides, accompanied by minor and variable amounts of pyrite and magnetite. Grade is a function of the density of fracturing and mineralogy of the veins. Alteration is generally confined to narrow envelopes bordering veins.

The Brenda Mine commenced production in 1969. The orebody is mined by conventional open-pit methods, and both copper concentrate and molybdenum concentrate are produced. The molybdenum concentrate is further upgraded by hot chloride leaching to reduce the presence of copper and lead.

Waste stripping from the south wall of the pit, which began in December 1987, continued throughout 1988 to recover the additional ore discovered in 1987. Further exploration was carried out in the bottom and on the northwest corner of the pit, but no economical mineralization was discovered. Mill throughput in 1988 averaged 30,931 tonnes/day, a record for the second consecutive year. Due to higher copper prices, approximately 3.1 million tonnes of low grade stockpile material was treated.

An agreement, which was reached with B.C. Hydro to relate hydro charges to copper prices, helped to extend the mine life. However, due to exhaustion of reserves, preparations were underway for closure of the mine, expected in 1990.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, pp.26-27.

_____. Mining in British Columbia, 1981-1985, p.19.

_____. Mining in British Columbia, 1986-1987, p.60-61.

C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.186-194.

MI 92H/NE-47.

BRENDA

	1987	1988
Ore Shipped or Treated (t)	10 291 405	11 286 146
Product Shipped (t)		
Copper concentrates (t)	62 578	60 377
Molybdenite concentrates (t)	6 597	5 551
Gross Metal Content		
Gold (g)	134 837	142 123
Silver (g)	8 963 675	9 229 595
Copper (Kg)	17 725 664	18 133 120
Molybdenum (Kg)	4 361 280	3 368 315

HEDLEY TAILINGS - LEACH OPERATION
(Fig.3, No.20)

Osoyoos M.D. Lat.49°21' Long.120°04' (92H/8E)

The property is located next to Highway 3 at Hedley, some 220 km east of Vancouver, 30 km east of Princeton and 29 km northwest of Keremeos.

The operation is owned by Candorado Mines Ltd., 707-626 West Pender Street, Vancouver, B.C., V6B 1V9.

In 1987 an evaluation of the feasibility of reprocessing the tailings was conducted. In 1988, heap leaching facilities were constructed, and by the fall of the year, the company had commenced reworking the mine tailings from the Mascot and Nickel Plate mines. The 1.7 million tonnes of tailings cover 26 hectares and have an average grade of 1.24 grams per tonne. The company anticipates treating the tailings at an expected rate of 4 500 tonnes per day over a period of two years.

References:

Canadian Mines Handbook, 1988-1989.
MI 092HSE144

HEDLEY TAILINGS

	1987	1988
Ore Shipped or Treated (t)		22 000
Product Shipped		
Dore bullion		
Gross Metal Content		
Gold (g)		3 600
Silver (g)		144

NICKEL PLATE
(Fig.3, No.21)

Osoyoos M.D. Lat.49°22' Long.120°02' (92H/8E)

The property is located 6 kilometres north of Hedley and about 40 kilometres west of Penticton, B.C. It is accessed via the Nickel Plate road from Hedley.

The mine is owned by Corona Corporation, 1900-120 Adelaide Street West, Toronto, Ontario, M5H 1T1, since the amalgamation of Mascot Gold Mines Ltd. with four other related companies in July, 1988.

The ore occurs in beds of the Nickel Plate Formation, where silicification has taken place forming skarn minerals. Ore concentration is controlled by intrusive dioritic dykes and sills which separate the mineralized beds. Gold occurs as minute grains in association with arsenopyrite and bismuth tellurides, and as electrum associated with late stage intergrowths of chalcopyrite, pyrrhotite, and sphalerite. Silver, copper, and cobalt are lesser minerals.

This open pit gold/silver operation began production in 1987 using conventional mining methods in three open pits. During 1988, open-pit ore was supplemented with approximately 230 tonnes of ore per day from an adit drilled into a deep section of the orebody. Changes in the mill, and an expansion of crushing capacity with the commissioning of a new gyratory crusher, increased throughput to more than 2,700 tonnes/day. After crushing and grinding, gold values are recovered from solution by zinc precipitation and then refined to produce dore bullion.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.21.
_____. Mining in British Columbia, 1986-1987, p.61-62.
MI 92H/SE62.

NICKEL PLATE

	1987	1988
Ore Shipped or Treated (t)	481 454	879 645
Product Shipped Gold bullion		
Gross Metal Content		
Gold (g)	1 512 428	2 714 889
Silver (g)	832 389	2 955 710

SIMILCO (Similkameen)
(Fig.3, No.22)

Similkameen M.D. Lat.49°20' Long.120°33' (92H/7E)

The Newmont copper deposit is located 24 kilometres south of Princeton, B.C., and is accessed via Highway #3 East and the Copper Mountain road. The concentrator is located across the Similkameen River from the open pit, 16 kilometres south of Princeton. It is accessed via Highway #3 West.

Effective May 31, 1988, the operation was purchased from Newmont Mining Corporation by Cassiar Mining Corporation, 2000-1055 West Hastings Street, Vancouver, B.C., V6E 3V3, and a new company, Similco Mines Limited, was created.

All of the known copper deposits lie in a 1,100 metre by 4,300 metre belt of Nicola volcanic rocks, bounded on the south by the composite Copper Mountain stock and on the north by the Lost Horse intrusive complex. It is believed that the Copper Mountain intrusions, the mineralization associated with them, and the volcanic rocks, are all of late Triassic age. Fluids producing alteration and mineralization came from the Lost Horse complex of porphyries and porphyry breccias. Alteration is intense, involving biotite, later pink feldspar, and scapolite. Mineralization of chalcopyrite and bornite is in fracture fillings and disseminations. Pegmatite veins, containing potash feldspar, biotite, and striking masses of bornite occur up to 2.3 metres thick.

This is a conventional open-pit mine which encompasses the old Copper Mountain (1920) and Ingerbelle (1972) properties. The ore is crushed at Copper Mountain then transported via cable conveyor over a suspension bridge to the concentrator. The concentrator has a capacity in excess of 22,750 tonnes/day, producing concentrate which is trucked to Vancouver for shipment.

As of 1988, open-pit reserves were sufficient to sustain the operation for at least five years; however, exploration work was underway to assess new mineralized zones adjacent to the open pits. In late 1988, clearing and stripping for a planned new open pit began.

References:

B.C. Ministry of Energy, Mines & Pet.Res. Bull. 59, Geology of Copper Mountain, British Columbia, 1972.

_____. Mining in British Columbia, 1975-1980, Vol.1, pp.28-29.

_____. Mining in British Columbia, 1981-1985, pp.22-23.

_____. Mining in British Columbia, 1986-1987, p.62-63.

C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.368-375.

MI 92H/SE-13.

SIMILCO (Similkameen)

	1987	1988
Ore Shipped or Treated (t)	6 974 560	7 189 690
Product Shipped		
Copper concentrates (t)	75 039	90 052
Gross Metal Content		
Gold (g)	448 668	524 529
Silver (g)	12 352 964	12 685 957
Copper (Kg)	23 803 935	27 195 638

SKEENA MINING DIVISION

CINOLA
(Fig.3, No.23)

Skeena M.D. Lat.53°32' Long.132°13' (103F/9E)

The property is located 18 kilometres south of Port Clements, B.C., on Graham Island in the Queen Charlotte Islands.

The operation is owned by City Resources (Canada) Ltd., Suite 2000, Park Place, 666 Burrard Street, Vancouver, B.C., V6C 2X8.

Low grade gold mineralization occurs within silicified pebble conglomerate, with interbedded sandstone and siltstone of Miocene age overlying a Cretaceous shale sequence. The gold is associated with a rhyolite dyke along the shale and conglomerate. The mineralization zone extends 300 metres vertically over an area of 1000 metres by 300 metres.

Following completion of the Feasibility Study, a Stage II Environmental Report was submitted in July 1988. The Report was under review by various government agencies for most of the year. This review and the economic feasibility study were ongoing at year end. The proposed open-pit operation would have an average throughput of approximately 6000 tonnes/day, for a project life of 12 years.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.23.
_____. Mining in British Columbia, 1986-1987, p.63.
MI 103F-34.

PREMIER GOLD PROJECT
(Fig.3, No.24)

Skeena M.D. Lat.56°04' Long.130°02' (104B/1E)

The property is comprised of the Silbak Premier and Big Missouri mine site, located 15 and 25 kilometres respectively north of Stewart, B.C., on the Granduc road.

The property is presently being developed by a consortium of companies led by Westmin Resources Ltd., Suite 1800, Bow Valley Square III, 255-5th Avenue S.W., Calgary, Alberta, T2P 3G6.

Two types of mineralization occur at the Silbak Premier site. The main type is related to the emplacement of a moderate to steeply dipping subvolcanic porphyritic dacite-Premier porphyry within host andesite of the Hazelton Group. The second occurs entirely within andesite as stratigraphically controlled zones, with sharp boundaries to wallrock alteration. The Big Missouri area is characterized by more than 16 zones of surface mineralization. These zones are located in three extensive stratigraphic horizons within andesitic volcanic rocks of the Hazelton Group.

In early 1988, development of the Premier and Dago pits began, as well as construction of the mill and related facilities. The haulage road from the Dago pit to the mill was completed, while the Premier haul road is expected to be completed in August, 1989. The tailings area and water system were also was completed.

Production of gold and silver is expected to commence in mid-1989, at a rate of 2000 tonnes/day with a work force of 157. Mining will be by conventional open-pit methods and will be seasonal, with stockpiling ore, due to the high snowfall. Favourable results from underground exploration suggest that the mine life will be more than tha original 10.5 years of open-pit reserves.

References:

B.C. Minister of Mines. Annual Report 1964, pp.21-22.
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.31.
_____. Mining in British Columbia, 1981-1985, p.25 (Silbak Premier).
_____. Mining in British Columbia, 1986-1987, p.64.
MI 104B-54; 104B-46.

SLOCAN MINING DIVISION

SILVANA (Silmonac)
(Fig.3, No.25)

Slocan M.D. Lat.49°58' Long.117°15' (82F/14W)

The property is located on the east bank of Tributary Creek, 1.6 kilometres west of Sandon, B.C. Access is via eight kilometres of paved highway and six kilometres of gravel road from New Denver, B.C.

The mine is owned by Dickenson Mines Ltd., 2600-130 Adelaide Street West, Toronto, Ontario, M5H 3P5.

The deposit lies in the main Slocan lode; the structure being mined occurs as a lode within a strong shear that cuts Slocan Group sedimentary rocks and dips at 20-30 degrees. The oreshoots vary in width from a few centimetres to three metres, and can be considerably altered by graphite shearing. Lead and zinc mineralization, with significant silver content, occurs in veins, pods and lenses and is mainly in the form of argentiferous galena and sphalerite.

The mine essentially comprises the old Ruth Hope and Silversmith properties with operations dating back to 1927. The property had a series of operators until purchased by the present owners in 1977. This is an underground silver mine using a subdrifter slash room and pillar method. Lead and zinc concentrates are produced and hauled to the smelter in Trail. During 1986 and 1987, an underground exploration program continued to increase ore reserves. This program of diamond drilling continued throughout 1988 and is expected to be completed in 1989.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, pp.36-37.

_____. Mining in British Columbia, 1981-1985, p.27.

_____. Mining in British Columbia, 1986-1987, pp.64-65.

MI 82F/NW-50.

SILVANA (Silmonac)

	1987	1988
Ore Shipped or Treated (t)	21 929	26 861
Product Shipped (t)		
Lead concentrates (t)	2 821	2 112
Zinc concentrates	2 611	3 194
Gross Metal Content		
Silver (g)	14 865 629	13 070 956
Lead (Kg)	2 103 701	1 679 253
Zinc (Kg)	1 508 152	1 965 886

METAL MINES WHICH CEASED OPERATIONS DURING THE 1986-1987 PERIOD

The following metal mines were described in Mining in British Columbia, 1986-1987, but are not now active producers.

Craigmont - Mining and milling activities ceased in 1982 and no product has been shipped since 1987.

Duthie - Operations ceased in 1986.

Mosquito Creek - Activities at the mine ceased on November 27, 1987, when the operation was placed on a care and maintenance basis.

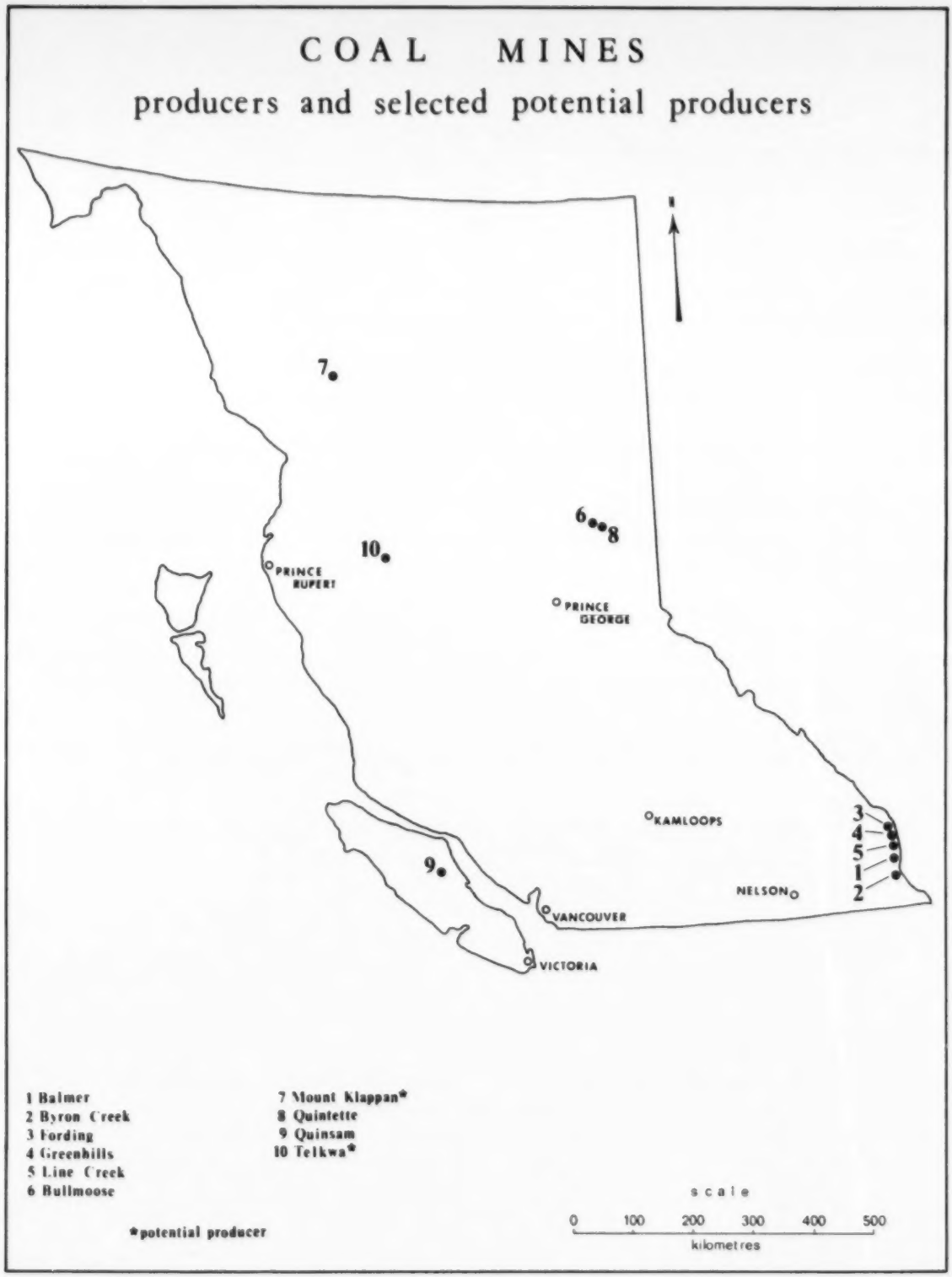

COAL MINES
producers and selected potential producers
N
7
6
8
10
PRINCE RUPERT
PRINCE GEORGE
KAMLOOPS
3
4
5
1
2
9
NELSON
VANCOUVER
VICTORIA
1 Balmer
2 Byron Creek
3 Fording
4 Greenhills
5 Line Creek
6 Bullmoose
7 Mount Klappan*
8 Quintette
9 Quinsam
10 Telkwa*
*potential producer
scale
0 100 200 300 400 500
kilometres

Figure 4

COAL MINES

FORT STEELE MINING DIVISION

BALMER
(Fig.4, No.1)

Fort Steele M.D. Lat.49°45' Long.114°45' (82G/16W)

The mining operations are located on Harmer Ridge, five kilometres southeast of Sparwood, B.C. The preparation plant is located in the Elk Valley, three kilometres from Sparwood.

The mine is owned by Westar Mining Ltd., 1900-1176 West Georgia Street, Vancouver, B.C., V6E 4B9.

The Balmer operations are located on a syncline at the north end of the Fernie Basin. The area is underlain by the Kootenay Formation which is a series of interbedded sandstones, mudstones, siltstones, shales, conglomerates and coal seams up to 665 metres in thickness. In the area of the mine up to 18 metallurgical coal seams are evident. The seams generally dip at 15-20° and are disturbed by numerous thrust faults. In 1988, eight seams were mined, of which the 15m thick '10' Seam comprised 69% of production.

This is the largest open pit coal mine in the world, with production in the area dating back to the turn of the century. Mining is by open pit, truck and shovel methods on 15 metre benches; product is a low volatile bituminous coal. After treatment in the Elkview preparation plant, the coal is hauled to the Roberts Bank terminal in unit trains. The major customers are overseas steel manufacturers.

The project to raise the lagoon "D" dyke to elevation 3717, started in 1987, was completed in 1988.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.51.
_____. Mining in British Columbia, 1981-1985, p.74.
_____. Mining in British Columbia, 1986-1987, p.69.
_____. Coal in British Columbia, Paper 1986-3, p.25.
MI 82G/NE-11,13,14,16,23.

BALMER

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	79 946	3 483 414	3 563 360
1987	1 325 841	3 734 298	5 060 139
1988	473 241	5 656 251	6 129 492

BYRON CREEK
(Fig.4, No.2)

Fort Steele M.D. Lat.49°30' Long.114°40' (82G/10E)

The property is located near the old townsite of Corbin, approximately 35 kilometres southeast of Sparwood, B.C., and 30 kilometres east of Fernie, B.C. Access is via 25 kilometres of gravel road south from Highway 3.

Byron Creek Collieries Limited is a wholly-owned subsidiary of Esso Resources Canada Ltd., Esso Plaza, 237-4th Avenue SW, Calgary, Alberta, T2P 0H6.

The Coal Mountain operations are located on the eastern edge of the Crowsnest Coalfield. Coal Mountain comprises complex folded and faulted Jura-Cretaceous sedimentary rocks. One sub-bituminous coal seam is being mined, which averages about 30 metres in thickness.

The property is located at the old Corbin minesite, which was in production between 1908 and 1935. It is now an open pit, truck and shovel mine, producing thermal and weak coking coal. The raw coal is crushed in a rotary breaker, cleaned and dried, then loaded on to rail cars at the loadout facility. The product is shipped to both domestic and export markets.

In 1988, construction of an access road at the north end of Pit 14 was undertaken.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.50.
_____. Mining in British Columbia, 1981-1985, p.71.
_____. Mining in British Columbia, 1986-1987, p.70.
_____. Coal in British Columbia, Paper 1986-3, p.26.
MI 82G/NE-1.

BYRON CREEK

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	874 827	-	874 827
1987	614 672	177 454	792 126
1988	683 770	292 300	976 070

FORDING
(Fig.4, No.3)

Fort Steele M.D. Lat.50°12' Long.114°52' (82J/2W)

The property lies in the upper Fording River Valley, 68 kilometres north of Sparwood. Access is via 30 kilometres of paved road northeast of Elkford, B.C.

Fording Coal Limited is owned by Canadian Pacific Limited, 200-205 9th Avenue SE, Calgary, Alberta, T2G 0R4.

The property is in the northern section of the Elk Valley coalfield in the Fording River Valley. Medium to high volatile coal measures are contained in the Mist Mountain Formation of the Juro-Cretaceous Kootenay Group. This interbedded sequence of sandstone, siltstone, mudstone and coal has been folded into two broad, asymmetric synclines. The intervening anticline has been faulted then eroded.

Production at Fording commenced in the early 1970s. The mine operates on both sides of the Fording River with the office, maintenance site and preparation plants located on the east side at the base of Eagle Mountain. The mine is open-pit, involving multi-seam truck and shovel operations and one dragline. The coal is shipped by rail to Westshore Terminals and Thunder Bay, for sale to both domestic and export markets.

In 1988, construction of impervious lifts to the south tailings pond dyke continued. In addition, the coal washplant circuit was upgraded to improve efficiency. The exploration program focussed on the North Castle Mountain, Henretta Creek and Lake Mountain areas.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.51.
_____. Mining in British Columbia, 1981-1985, p.73.
_____. Mining in British Columbia, 1986-1987, p.70-71.
_____. Coal in British Columbia, Paper 1986-3, p.24.
MI 82J/SE-9, 12.

FORDING

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	492 816	4 627 363	5 120 179
1987	837 617	5 081 895	5 919 512
1988	437 251	5 316 972	5 754 223

GREENHILLS
(Fig.4, No.4)

Fort Steele M.D. Lat.50°06' Long.114°52' (82J/2W)

The mine is located 40 kilometres north of Sparwood, B.C., and ten kilometres northeast of Elkford, B.C., in the upper Elk Valley. Access is via road from Elkford.

The operations are owned by Westar Mining Ltd., 1900-1176 West Georgia Street, Vancouver, B.C., V6E 4B9.

The property is nearly midway along the Elk Basin, which is the northern section of the Crowsnest Coalfield. The seams are contained in the coal-bearing member of the Kootenay formation within an elongate synclinal formation trending north-northwest. Numerous small-scale normal and thrust faults complicate mining on the east limb and axis of the syncline. Twenty-nine seams are known to exist; however only a few are economic to mine. The coals are of medium-volatile bituminous rank, and of high-volatile A bituminous rank.

The Greenhills mine began to produce metallurgical coal in 1983. The operation is an open pit, multi-seam coal mine, using conventional truck and shovel methods. Two main end products are produced for the export market: high quality metallurgical coal and raw thermal coal at about 15% ash. These products are shipped by train to Westshore Terminals at Roberts Bank.

In 1988, major projects underway included: a pit production monitor and control system; a railway truck scale; and the development of a coarse refuse storage area for the plant.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.51.

_____. Mining in British Columbia, 1981-1985, pp.74-75.

_____. Mining in British Columbia, 1986-1987, p.71-72.

_____. Coal in British Columbia, Paper 1986-3, p.24.

MI 82J/SE-7.

GREENHILLS

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	741 220	1 694 393	2 435 613
1987	872 775	2 255 121	3 128 096
1988	618 698	2 428 144	3 046 842

LINE CREEK
(Fig.4, No.5)

Fort Steele M.D. Lat.49°57' Long.114°46' (82G/15W)

The Line Creek Mine site is located in the Crowsnest Pass area, approximately 24 kilometres northeast of Sparwood, B.C. and 14 kilometres southeast of Elkford, B.C. The plant site, located adjacent to the C.P. railway spur-line to Fording Coal, is situated 9 kilometres downstream from the mine. Access is via an eastern lateral from Highway #43, midway between Sparwood and Elkford.

Crows Nest Resources Limited, P.O. Box 2003, Sparwood, B.C., is owned by Shell Canada Limited, 400-4th Avenue SW, Calgary, Alberta, T2P 0J4.

The Line Creek property is situated on the west limb of the Alexander Creek syncline, near the south end of the Elk Valley Coalfield. The coal lies in the Kootenay Formation and is deposited in ten seams, of which seven are being mined in the current pit. These seven seams are thicker than 2.8 metres and have an aggregate thickness of up to 55 metres. Ninety percent of the reserves are in the four lower seams. The product is a low-medium volatile metallurgical grade bituminous coal, with the oxidized outcrop marketed as thermal coal.

Production began in 1982, with the metallurgical plant coming on stream in 1983. This is an open-pit mine, mining 12m benches using conventional truck and shovel methods. In 1987, production began from the Lower South pit adjacent to the main pit. No major projects were undertaken in 1988.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.72.
_____. Mining in British Columbia, 1986-1987, p.72.
_____. Coal in British Columbia, Paper 1986-3, p.25.
MI 82G/NE-20

LINE CREEK

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	n/a	n/a*	1 700 000
1987	567 815	1 152 065	1 719 880
1988	657 073	1 346 699	2 003 772

* not available

LIARD MINING DIVISION

BULLMOOSE
(Fig.4, No.6)

Liard M.D. Lat.55°06' Long.121°30' (93P/3W)

The Bullmoose mine is located 87 kilometres south of Chetwynd, B.C., and 35 kilometres northwest of Tumbler Ridge, B.C. It is accessed by following Highway 29 to Kilometre 71, then west along Bullmoose Creek for 18.5 kilometres.

The managing partner and operator is Teck-Bullmoose Coal Inc., 1199 West Hastings Street, Vancouver, B.C., V6E 2K5.

In two areas on the Bullmoose property the lower part of the Gates Formation occurs at shallow depth and with gentle dips; the northern portion is the "West Fork" area and the southern portion is the "South Fork" area. The West Fork area lies along the axial portion of a broad syncline and strata are generally flat lying for about two kilometres along the structure. In the South Fork area, the lower Gates strata form a platter-shaped outlier which dips gently to the north and is crudely concordant with the slope. Erosion has exposed coal seams around the entire periphery of the South Fork area, and along the southern edge of the West Fork area. Five mineable seams have been identified that range from less than a metre to five metres in thickness, and have an aggregate thickness of approximately 12 metres.

This is a conventional truck and shovel operation. After treatment in the preparation plant, the coal is transported by truck to rail load-out silos, and is then hauled by unit train to Prince Rupert. The coal is sold to Japanese steel companies under long term contracts which provide for shipments of 1.7 million tonnes/year..

The mine officially opened in 1984 with operations continuing normally throughout 1988. At year end reserves were estimated to be 45 million tonnes.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.75-76.
_____. Mining in British Columbia, 1986-1987, p.73.
_____. Coal in British Columbia, Paper 1986-3, p.20.
MI 93P-1,12,16.

BULLMOOSE

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	69 618	2 098 000	2 167 618
1987	-	1 700 168	1 700 168
1988	78 873	1 716 889	1 795 762

MOUNT KLAPPAN
(Fig.4, No.7)

Liard M.D. Lat.57°15' Long.128°45' (104H/2W)

The Mount Klappan coal property is located 150 kilometres northeast of Stewart, B.C. Access to the property is gained by following Highway 37 north from the Meziadin junction to the Ealue Lake turnoff, 17 kilometres south of Iskut. The property is then accessed by following the railway grade for 140 kilometres.

The Mount Klappan anthracite project is controlled by the Coal Division of Gulf Canada Resources Inc., 401-9th Avenue S.W., Calgary, Alberta, T2P 2H7.

The Mount Klappan property is located on the Groundhog coal deposits in the Skeena Mountains. The structure at Mount Klappan shows open to tight folds that are almost vertical or are overturned to the northeast. The whole area is cut by younger high-angle faults trending northwest, north or northeast. The coal measures have a minimum thickness of 350 metres and consist of conglomerate, sandstone, mudstone, marl and coal seams. The coal seams occur in three units - the Lower, Middle, and Upper units - and are ranked as anthracite.

During 1988, exploration continued at this open-pit trial excavation. A program of reclamation trials was also begun to reclaim exploration disturbance and to provide information for a Mine Reclamation Permit. At year-end, the Stage II report to the Mine Development Steering Committee was still under review, and no market arrangements had been announced.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.76-77.
_____. Mining in British Columbia, 1986-1987, p.74.
_____. Coal in British Columbia, Paper 1986-3, p.31.
MI 104H-20,21.

QUINTETTE
(Fig.4, No.8)

Liard M.D. Lat.55°01' Long.121°13' (93P/3E)

The mine site is located 120 kilometres south of Chetwynd, B.C., and 12 kilometres west of Tumbler Ridge, B.C. It is accessed either by Highway 29, or by the Heritage Highway through Tumbler Ridge, to the Quintette plant site.

The managing partner and operator of the mine is Denison Mines Ltd., P.O. Box 11575, 650 West Georgia Street, Vancouver, B.C., V6B 4N7.

The Gates Formation and the Gething Formation both contain coal seams of mineable thickness on the Quintette property; however, the Gates Formation contains all the reserves. Underlying the Babcock Mountain area is an extensive area of gently dipping seams bounded by dipping limbs. Six seams are of mineable thickness and two pits have been delineated: the Babcock pit on the eastern slope of Babcock Mountain; and the Roman pit, located within a fairly simple chevron fold at the southern end of the Murray syncline. North of the Murray River, in the Wolverine area, two more pits have been delineated. The Mesa pit, which is located on Mast Ridge, is contained in a complex syncline overlying a large thrust fault. The Deputy pit is situated in a smaller syncline immediately to the southwest and is contiguous with the Mesa pit. The Mast syncline, an area of relatively minor faulting, is located further to the southwest of the Mesa pit and contains the Wolverine pit.

The Quintette Mine commenced production in 1983. This is a conventional truck and shovel operation for both waste removal and coal recovery. The mine produces metallurgical coal which is sold to a consortium of Japanese steel manufacturers under long-term contract.

During 1988, negotiations were underway between Quintette Coal Ltd. and the Japanese consortium over the price of coal. The result of these negotiations could seriously jeopardize this operation if the selling price for coal is markedly reduced.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.77-78.
_____. Mining in British Columbia, 1986-1987, pp.74-75.
_____. Coal in British Columbia, Paper 1986-3, p.21.
MI 93I/10,11, MI 93P/19,20.

QUINTETTE

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1986	105 055	5 201 422	5 306 477
1987	9 037	4 452 252	4 461 289
1988	48 073	4 927 499	4 975 572

NANAIMO MINING DIVISION

QUINSAM
(Fig.4, No.9)

Nanaimo M.D. Lat.49°50' Long.125°18' (92F/14W)

This operation is located on Vancouver Island, 31 kilometres southwest of Campbell River, B.C.

The mine is owned by Brinco Coal Corp., 1480-1055 West Hastings Street, Vancouver, B.C., V6E 2E9.

The Quinsam coal measures are an erosional outlier of the Comox Formation, part of the Nanaimo Group. Coal measures are bounded and underlain by basement rocks of Triassic and Jurassic age. Coal is found in the Cumberland and Dunsmuir members of the Comox Formation, with siltstone, mudstone and sandstone. Major coal seams are the Quinsam No.1 and No.2 beds in the Cumberland member, which are well exposed in the Quinsam mine highwall, and the Quinsam No.3 and No.4 beds in the Dunsmuir member. Coal bed No.1 is being mined. It is located north of Middle Quinsam Lake and ranges from 3.3 to 4.2 metres in thickness.

In 1987, mine and reclamation plan approvals as well as environmental permits were granted, allowing Brinco to operate a surface coal mine with a capacity of up to one million tonnes/year. A settling pond dam was constructed and stripping of a 50,000 tonne bulk sampling pit was initiated.

Mining on a limited production scale began at the end of 1987, producing thermal coal at a rate of 15,000 tonnes/month for sale to the B.C. cement industry. Coal is mined by truck and shovel methods, crushed, and hauled from the mine site to the Middle Point Marine Terminal located 37 kilometres northeast. In addition to the open pit, a small underground mine is planned to come into production by 1991.

In July, 1988, on-site crushing began when a portable triple roll crusher was installed. Previously, all crushing and screening operations were done on a contract basis at Uplands Contracting Ltd. The Uplands processing and stockpile area continued to be used until September, after which the coal stocks were gradually drawn down. Final shipments and clean-up at this location are expected to be complete by May, 1989. Operations ceased on December 16, 1988, for a winter shutdown.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Coal in British Columbia, Paper 1986-3, p.30.

_____. Mining in British Columbia, 1986-1987, p.75.

MI 092F-319.

QUINSAM

Year	Clean Coal Production (tonnes) Thermal	Metallurgical	Total
1988	131 349	0	131,349

OMINECA MINING DIVISION

TELKWA
(Fig.4, No.10)

Omineca M.D. Lat.54°35' Long.127°10' (93L/11E)

The Telkwa property is located approximately 10 kilometres southwest of the village of Telkwa, B.C., adjacent to Goathorn Creek.

Crows Nest Resources Limited (Telkwa Prospect), c/o Box 100, Calgary, Alberta, T2P 2H5, is owned by Shell Canada Resources Limited.

The coal measures of the Telkwa basin occur within the Skeena Group which is of Cretaceous age. These coal measures dip to the northeast or east, generally average 400 metres in thickness, and consist of three stratigraphic units. The coal seams are found in the upper zone of the lower unit and the lower zone of the upper unit. The coal ranges from medium- to high-volatile bituminous in rank.

In 1988, the company conducted an extensive exploration program north of the Telkwa River. Crows Nest Resources has received approval-in-principle to develop the Telkwa coal deposits; however, poor market conditions continue to delay production at this development.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.79.
_____. Mining in British Columbia, 1986-1987, p.76-77.
_____. Coal in British Columbia, Paper 1986-3, p.31.
MI 93L/152,155,156.

INDUSTRIAL MINERALS AND STRUCTURAL MATERIALS

ASBESTOS

1. CASSIAR ASBESTOS

Liard M.D. Lat. 59°20' Long.129°49' (104P/5W;104P/5E)

The mine is located on Mount McDame, approximately 4.8 kilometres north of Cassiar, B.C. The plant site is nine kilometres from Highway 37, approximately 120 kilometres north of Dease Lake.

The property is owned by Cassiar Mining Corporation, 2000-1055 West Hastings Street, Vancouver, B.C. V6E 3V3.

The orebody is in a sill-like mass of serpentinite, intrusive into Devonian-Mississipian sedimentary rocks. The orebody strikes north and dips 30-40° to the east. Numerous veinlets of chrysotile asbestos occur in light to dark green serpentinite. Magnetite is fairly abundant, occurring in disseminated microscopic veinlets and larger aggregates. Other associated minerals include magnesite, brucite, and antigorite. On the hanging-wall, zones of zoisite-quartz-tremolite hornfels occur at the contact of serpentinite with argillites and contain local, irregular bodies of nephrite jade.

This open pit mine commenced operations in 1953; the present open pit orebody will sustain operations until the beginning of 1991. The mine uses truck and shovel methods, and is capable of producing in excess of 100,000 tonnes of high quality chrysotile asbestos fibre per year. The fibre is packaged, transported by road to the dock at Stewart, B.C., then barged to Vancouver, B.C. Sales are made to customers in 45 countries around the world.

Development of the McDame underground mine began in May, 1988. Development is expected to be complete by March, 1990, with full production of 5,500 tonnes per day to be achieved by the end of that year. This will then be one of the largest underground mines in B.C. Approximately 16 million tonnes of ore will be mined at McDame, with operations continuing until at least 2000.

During 1988, mining of the open pit was accelerated to finalize ore extraction by May, 1989. The waste-to-ore ratio decreased as the pit bottom was approached but slope stability became a problem. Ore is being stockpiled to be used as mill feed until the McDame mine is operating. Modifications were made to the mill which increased efficiency. In addition, a wet milling pilot plant began operating in August at a rate of 1,000 tonnes/year.

This was the first year that the operation ran for the full twelve months since 1981. Record production of 106,085 tonnes of fibre was achieved in 1988, compared to 96,014 tonnes in 1987.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.41.
_____. Mining in British Columbia, 1981-1985, p.52.
_____. Mining in British Columbia, 1986-1987, p.78.

MI 104P-5; 104P-084

2. BAR-WELL RESOURCES

Golden M.D. Lat.50°40' Long.116° (82J/K)

The property is located in the Windermere area of the East Kootenay, near Invermere, B.C. The operation is owned by Dynamic Drilling Fluids, 230-1110 8th Avenue S.W., Calgary, Alberta, T2P 1J2.

The working plan is to produce 5000 tonnes of drilling grade barite; however, the operation is presently shut-down pending improved market conditions.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.79.

3. BRISCO

Golden M.D. Lat.50°49' Long.116°19' (82K/16W)

The Brisco mine is located four kilometres west of the hamlet of Brisco, B.C., at an elevation of 990 metres. It is owned by Mountain Minerals Co. Ltd., Box 700, Lethbridge, Alberta., T1J 3Z6.

During 1988, all useful equipment was salvaged and this former underground mine was abandoned.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol. 1, p.42.
_____. Mining in British Columbia, 1981-1985, p.54.
_____. Mining in British Columbia, 1986-1987, p.79.
MI 82K/NE-13.

4. PARSON

Golden M.D. Lat 51°01' Long.116°39' (82N/2E)

The property is located seven kilometres southwest of Parson, B.C., at an elevation of 1,200 metres. It is accessed by crossing the Columbia River from Parson and following the Crestbrook forest road.

The mine is owned by Mountain Minerals Limited, Box 700, Lethbridge, Alberta., T1J 3Z6.

The barite occurs as multiple veins striking NW-SE for up to 300m, and dipping SW at 5°-55°. Host rocks are greywackes, dolomite, and shales of precambrian age.

This is an underground mine using room and pillar methods. Depending on vein conditions, low grade ore or direct grinding ore is mined. Low grade ore is stockpiled on the surface for crushing and jigging. The jigfine and coarse products, as well as the direct grinding ore, are transported to Mountain Minerals' grinding plant in Lethbridge, Alberta. The crushing and jigging facility, constructed in 1987, was modified during May and June, 1988. The operation was active from the end of June to mid-November.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol. 1, p.42.
_____. Mining in British Columbia, 1981-1985, p.53.
_____. Mining in British Columbia, 1986-1987, p.80.
MI 82N-2.

DIMENSION STONE

In addition to the operations listed below, granite of medium texture is available from Nelson Island and other areas, and andesite has been quarried at Haddington Island off the northeast coast of Vancouver Island. Canroc Industries, Delta, B.C., produces various products from local and imported stone.

5. DOMINION CREEK (Beaverdell) GRANITE

Greenwood M.D. Lat.49°20' Long.119°03' (82E/6E)

This property is located on Highway 33 at Dominion Creek, 13 kilometres south of Beaverdell, B.C. It is operated by APS Architectural Precast Structures Ltd., Langley, B.C.

The quarry is only used on an as-required, intermittent basis. The stone is coarse-grained and porphyritic, with phenocrysts of pink orthoclase feldspar. This coarse pink granite is used for ornamental architectural purposes in precast concrete aggregate blocks, and as sheets for outside facing. It is marketed under the name "Cascade Coral".

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.81.
_____. British Columbia Dimension Stone, IC 1988-6, p.9.

6. KNIGHT INLET GRANITE

Vancouver M.D. Lat.51° Long.126° (92K/12W)

The quarry is located approximately 250 kilometres northwest of Vancouver on the north shore of Knight Inlet. It is owned by Ranex Industries (the successor company of Kellard Marble Inc.), 2040 West 12th Avenue, Vancouver, B.C., V6J 2G2.

The stone is medium-grained with an attractive blue-grey colour, darkened by well-shaped crystals of hornblende and black mica. Reserves of 62,500 m^3 of fresh, unaltered "granite" are reported.

The quarry has operated intermittently since 1985, producing monumental and ornamental stone known as "Catherine Blue Granite".

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.81.
_____. British Columbia Dimension Stone, IC 1988-6, p.17.

7. REVELSTOKE FLAGSTONE

Revelstoke M.D. Lat.50°56' Long.118°12' (82L/16E)

This operation is located on Begbie Road in Revelstoke, B.C., and is owned by A. McKenzie, Box 397, Revelstoke, B.C.

This small, one-man enterprise was started in 1957 and operates in the summers only. Drilling and blasting is done to loosen the slabs, followed by hand splitting. The stone is a light grey muscovite mica-schist which is supplied to building material companies in B.C. and Alberta. In 1988, production of saleable product was 39 tonnes of flagstone and 122 tonnes of rip-rap.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.82.
_____. British Columbia Dimension Stone, IC 1988-6, p. 26.

8. SALMO QUARTZITE

Nelson M.D. Lat.49° Long.117° (82F)

The operation is owned by the Kootenay Stone Centre, Box 486, Salmo, B.C., V0G 1Z0.

Several types of quartzite are produced from quarries situated from Sheep Creek in the south to Duncan Lake in the north. The stone is used for flagging and outside facing.

References:
B.C. Ministry of Energy, Mines & Pet Res. Mining in British Columbia, 1986-1987, p.82.
_____. British Columbia Dimension Stone, IC 1988-6, p.26.

9. SIRDAR GRANITE

Nelson M.D. Lat.49°16' Long.116°36' (82F)

This property is located approximately 22 kilometres north of Creston, B.C., on Highway 3A. The operations are owned by International Marble and Stone Company Ltd. (IMASCO), 19287-98A Avenue, Surrey, B.C., V3T 4W2.

A small quantity of granite is quarried to produce granules, poultry grit and similar products. The IMASCO processing plant is on the quarry site. This crushing and grinding plant is operated on a year-round basis, with most production being dolomite from Crawford Bay and calcium carbonate from Lost Creek. Plant production averages approximately 60,000 tonnes/year.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.82.

Four quarries operate on an intermittent basis to produce **railroad ballast**: C.P.R. operates the Walhachin quarry between Cache Creek and Kamloops, B.C.; C.N.R. operates the McAbbee quarry in the Walhachin area and the Giscome quarry on the west side of Eaglet Lake, east of Prince George, B.C.; and B.C.R. operates the Summit Lake quarry north of Prince George.

In 1988, C.P.R. purchased approximately 441,270 tonnes of waste float rock from the concentrator stockpile at Sullivan mine, primarily for use as railroad ballast.

CLAY AND SHALE

Several types of clay are found in B.C. Altered volcanic ash is extracted at Barnhartvale for cement, and at Quesnel for use in the manufacture of refractory materials. Common clay, fire clay and stoneware clay is extracted at Sumas Mountain.

Kaolinitic deposits are found near Prince George and at Lang Bay. In 1988, Fargo Resources Limited and Brenda Mines Limited continued exploration of the Lang Bay deposit; recent drill tests indicate mineable reserves of white filler grade and grey cement grade kaolin.

10. DUNSMUIR SHALE

Nanaimo M.D. Lat.48° Long.124° (92G)

The operation is located near Nanaimo on Vancouver Island, B.C. and is owned by Dunsmuir Quarries Ltd., 1505-1181 88th Avenue, Delta, B.C., V4C 8A2.

The site contains black shale which is mainly used in the manufacture of cement.

The quarry worked on an intermittent basis during 1988 as orders were received. A total of 100,000 tonnes was mined and 67,617 tonnes shipped from Breckin Point near Nanaimo to Vancouver.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.83.

11. FIRE CLAY

New Westminster M.D. Lat.49°03 Long.122°17 (92G/1E/1W)

The property is located at Sumas Mountain, near Kilgard, B.C. It is operated by Clayburn Industries Ltd., 33765 Pine Street, Abbotsford, B.C., V2S 5C1.

The mine is located in a small Eocene outlier that consists of a sequence up to 400 metres thick of alternating beds of claystones, siltstones and conglomerates. Several shale beds have been mined over the years, exhibiting a variety of fired colours ranging from buff-pink grey to deep red. A layer of fire clay three to four metres thick occurs at the base of the sequence, and exhibits pinkish white to light buff colour.

The operation includes both underground and open pits mines. Underground mining uses room and pillar methods on a single level and the open pits are worked on a bench system. The mine produces clays which are trucked to the plant in Abbortsford, B.C. for brick manufacture. In 1988, 30,000 tonnes of clays were mined.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Bull.30, Clay and Shale Deposits of British Columbia.
_____. Mining in British Columbia, 1975-1980, Vol. 1, p.43.
_____. Mining in British Columbia, 1981-1985, pp.56-57.
_____. Mining in British Columbia, 1986-1987, p.83.
MI 92G/SE-4, 5, 31.

12. STRAITON (SUMAS)

New Westminster M.D. Lat.49°06' Long.122°08' (92G/1E)

This quarry is located on Sumas Mountain, near Kilgard, B.C. It is owned by Canada Cement Lafarge Ltd., 1051 Main Street, Vancouver, B.C., V9A 2V9, and is operated by Toews Bros. Bulldozing of Abbotsford.

Thin sandstone and shale are bedded in near-horizontal layers from three to ten metres thick. The quarry is worked using a bench system, with bench heights of seven metres. Sandstone is drilled and blasted, and shale layers are ripped using bulldozers. Both products are trucked to an in-pit jaw crusher. The product is cement quality shale and sandstone for the Lafarge cement plant in Richmond, B.C.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.57.
MI 92G/SE-24.

DIATOMITE

There are many diatomite occurrences in British Columbia. The diatomite beds consist almost exclusively of Melosira granulata diatoms which are usually very small and are mixed with variable amounts of clay, silt and devitrified volcanic ash. In 1988, **Clayburn Industries Ltd.**, 33765 Pine Street, Abbortsford, B.C., V2S 5C1, produced 5000 tonnes of diatomite from its property at Quesnel.

The **Red Lake** diatomite deposit (MI 92I/NE-81) near Kamloops, B.C. was operated in 1986 to produce industrial and domestic absorbents. The operation was closed in 1987, but the operator, **Western Industrial Clay Products** of Kamloops, plans to resume operations in 1989.

DOLOMITE

13. CRAWFORD BAY

Nelson M.D. Lat.49°43' Long.117°46' (82F/10)

The quarry is located approximately 80 kilometres north of Creston, B.C. Access is via Highway 3A to two kilometres north of Crawford Bay, thence four kilometres via Crawford Bay Road.

The quarry is owned by International Marble and Stone Company Ltd. (IMASCO), 19287-98A Avenue, Surrey, B.C., V3T 4W2.

This is a 250-500 foot wide band of crystalline dolomite. It is part of the Bad Shot formation, extending from Crawford Creek to the head of Crawford Bay, and diagonally southwest across Pilot Point near the centre of the east side of Kootenay Lake.

This is an underground operation, using room and pillar methods, that has marketed several grades of pulverized dolomite. The white dolomitic limestone is processed at the IMASCO plant at Sirdar, B.C. A variety of products are produced including stucco dash, roofing chips, building stone, sand blasting sand, poultry grit, soil conditioners and landscaping chips

Reserves are approximately 2,000,000 tonnes, and production capacity is 136,500 tonnes/year. Actual production in 1988 was approximately 45,500 tonnes.

Reference:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, pp.84-85.

14. ROCK CREEK

Greenwood M.D. Lat.49°01' Long.118°58' (82E/2)

This property is located approximately 40 kilometres east of Osoyoos, B.C. Access is via Berger Road, four kilometres from Highway #3 and four kilometres east of Rock Creek, B.C.

The operator is Mighty White Dolomite, P.O. Box 10, Rock Creek, B.C., V0H 1Y0.

The deposit contains dolomite with magnesium, tungsten and thorium. The dolomite lens is associated with altered volcanic and sedimentary rocks of the Permian Anarchist Group.

This is an open pit mine and processing plant; the product is shipped by truck. Ground dolomite is produced for use as a soil conditioner, and white rock chips of varied size for landscaping and decorative purposes.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.58.
_____. Mining in British Columbia, 1986-1987, p.85.

GYPSUM

In British Columbia, gypsum has been produced from two areas: Falkland and the East Kootenays. There are two other lesser-known gypsum deposits: Forget-me-not Creek near the Alberta border, and O'Connor River near the Alaska panhandle where there has been some bulk sampling.

15. FALKLAND

Kamloops M.D. Lat. 50°30' Long.119°30' (82L/12E)

The operation is located one kilometre north of Falkland, B.C., south of Kamloops, B.C., and is owned by Lafarge Canada Inc., R.R. #2, Site 12, Comp.1, Kamloops, B.C., V2C 2J3.

Gypsum with anhydrite occurs as a series of lenses along two parallel shear zones. The deposit is interpreted as intrusion from underlying sediments by plastic flow during folding and faulting. The mineable gypsum was formed by hydration of anhydrite, which comprises the deeper parts of the deposits.

Gypsum is mined from an open pit and transported by truck to the company's cement plant near Kamloops. Production in 1988 was 6472 tonnes of gypsum.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol. 1, p.44,
_____. Mining in British Columbia, 1981-1985, pp.60-61.
_____. Mining in British Columbia, 1986-1987, p.85-86.
MI 82L/NW-1.

16. LUSSIER RIVER

Fort Steele M.D. Lat.50°02' Long.115°31'
(82J/4E)

The mine is located on the east bank of the Lussier River, approximately 2.5 kilometres south of its confluence with Coyote Creek, at an elevation of 1,306 metres. Access is via a gravel road which leaves Highway 93/95 six kilometres south of Canal Flats. The crushing, screening and rail load facility is located in Canal Flats.

The mine is owned by Domtar Inc., 12509 116th Avenue, Surrey, B.C., V3V 3S6.

This well-bedded and firmly-laminated gypsum deposit occurs in the Burnais Formation which is thought to be middle Devonian in age. The deposit is covered by glacial till and outcrop in the general area is scarce. The deposit is lens-shaped and conforms to the same contour as the Lussier River valley. The deposit is contaminated by vertical limestone inclusions and clayey layers. At depth the gypsum gradually turns into a massive anhydrite.

This is an open pit operation working 13m benches. Rock is hauled to a loadout at Canal Flats where it is crushed, then loaded into C.P. railcars and hauled to a plant in Edmonton. No major projects were undertaken in 1988 and production was 140,951 tonnes.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.59-60.
_____. Mining in British Columbia, 1986-1987, p.86.
MI 82J/SW-9.

17. WINDERMERE OPERATIONS

Golden M.D. Lat.50°29' Long.115°53' (82J/5W)

The property is located on the south fork of Windermere Creek, approximately 11 kilometres west of Invermere, B.C. The operation is owned by Westroc Industries Ltd., 2424 Lakeshore Road West, Mississauga, Ontario, L5J 1K4.

The gypsum deposit is part of the Burnais Formation evaporite sequence of Devonian age. The deposit becomes anhydrite at depth.

The operation includes two quarries, Elkhorn and Windermere, but most product now comes from the Elkhorn quarry. The gypsum is mined using conventional open pit methods. The blasted ore is transported to the primary crusher then to the secondary crushing and loading facility located on a spur adjacent to the C.P. rail tracks. The products are shipped to markets in B.C., Alberta and Washington State via CP Rail and/or highway transport.

In 1988, production of gypsum was 303,464 tonnes mined and 324,208 tonnes shipped.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.60.
_____. Mining in British Columbia, 1986-1987, p.86-87.
MI 82J/SW-9.

JADE

Jade in British Columbia occurs as lenticular bodies associated with alpine-type serpentinite intrusions of mid-Paleozoic to Triassic age. Generally, jade pods occur along contacts with cherty rocks; to a lesser degree they occur with volcanic or plutonic rocks.

18. CASSIAR

Liard M.D. Lat. 59°20' Long.129°49' (104P/5W)

Jade has been produced as a by-product at the Cassiar asbestos mine located on Mount McDame, approximately 4.8 kilometres north of Cassiar, B.C.

The property is owned by Cassiar Mining Corporation, 2000-1055 West Hastings Street, Vancouver, B.C. V6E 3V3.

No jade was mined during 1988. The company is selling off accumulated inventory and is terminating jade production.

Reference:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.87.

19. CONTINENTAL JADE

Omineca M.D. Lat.55°50' Long.125°46' (93N/13W)

This mine is located on the south side of Mount Ogden, approximately 120 kilometres northeast of Hazelton, B.C. It is operated by Jade West Resources Ltd., P.O. Box 126, White Rock, B.C., V4B 4Z7.

Ogden Mountain is the most famous jade property in B.C., with production since 1970. Production in 1988 was 22,000 kgs, all of which was marketed in the People's Republic of China.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.45.
_____. Mining in British Columbia, 1981-1985, p.61.
_____. Mining in British Columbia, 1986-1987, p.87 ; MI 93N-156,157.

20. FAR NORTH JADE

Omineca M.D. Lat.55°52' Long.125°50' (93N/13W)

The Far North group of claims is situated on the north side of Mount Ogden, approximately 120 kilometres northeast of Hazelton, B.C. The property is owned by Jade West Resources Ltd., P.O. Box 126, White Rock, B.C., V4B 4Z7.

Production at this site was 200,000 kgs in 1988. The majority of product is marketed in the People's Republic of China, with the remainder distributed in Taiwan, New Zealand, Germany and Canada.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.45.
_____. Mining in British Columbia, 1981-1985, p.61.
_____. Mining in British Columbia, 1986-1987, p.87-88.
MI 93N-165.

LIMESTONE

Some domestic limestone production is processed and used in British Columbia, while a significant tonnage is exported. The major production centre in B.C. is in the northern part of Texada Island. The main market is the cement and lime industry in Vancouver, the Puget Sound area, and Portland, Oregon.

21. BENSON LAKE

Nanaimo M.D. Lat.50°30' Long.127°30' (92L)

This quarry is located three kilometres southwest of Benson Lake, Vancouver Island, near the intersection of the road from Benson Lake to Port Alice and the main logging road. It is owned by International Marble and Stone Company Ltd. (IMASCO), 19287-90A Avenue, Surrey, B.C., V3T 4W2.

The white limestone is part of a thick section of generally grey coloured carbonate rocks of the Upper Triassic Quatsino Formation. Fresh, clean rock, uncontaminated by earthy soil, occurs between 0.5 metre to 1.0 metre below the surface. Three aplitic dykes crosscut the limestone. The limestone beds strike 120° and dip 30° northeast. About one third of the exposed beds are highly fractured while the rest is more massive and blocky.

A white, massive, fine-grained limestone is produced which is processed in the company's Surrey plant into different grades of fillers and extenders.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Geological Fieldwork, 1985, p.239.
_____. Mining in British Columbia, 1986-1987, p.88.

MI 92L-295

22. BLUBBER BAY

Nanaimo M.D. Lat.49°47' Long.124°37 (92F/15E)

The Blubber Bay quarry is located at the north end of Texada Island, one kilometre south of Blubber Bay. It is owned by Ash Grove Cement West Inc., 300-5550 S.W. Macadam Avenue, Portland, Oregon, 97201.

In 1988 the quarry was developed eastward, moving across the old highway. Production for the year was 998,653 tonnes of processed limestone and chemical rock.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.46.
_____. Mining in British Columbia, 1981-1985, p.63.
_____. Mining in British Columbia, 1986-1987, p.88.

MI 92F-397.

23. COBBLE HILL

Victoria M.D. Lat.48°40' Long.123°37' (92B/12E)

This quarry, which is located on the southwest corner of Cobble Hill, three kilometres southwest of Cobble Hill Station, Vancouver Island, operates only on an intermittent basis.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.45.
_____. Mining in British Columbia, 1981-1985, p.63.
_____. Mining in British Columbia, 1986-1987, p.89.

MI 92F-394.

24. DAHL LAKE

Cariboo M.D. Lat.53°47' Long.123°17' (93G/14W)

The quarry is located at the northeast corner of Dahl Lake, 35 kilometres southwest of Prince George. It is owned by Northrock Industries, P.O. Box 518, Prince George, B.C.

The quarry supplies several local pulp and paper mills with a chemical-grade limestone. The company selectively mines high-grade parts of the larger limestone body which is locally contaminated by intrusive dykes and siliceous zones.

Reference:
Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.47.
_____. Mining in British Columbia 1981-1985, p.65.
MI 93G-32.

25. HARPER RANCH

Kamloops M.D. Lat.50°40' Long.120°03' (92I/9E)

The quarry is situated on the north side of the South Thompson River, approximately 25 kilometres east of the City of Kamloops. It is approximately one kilometre north of the cement plant which is accessible by public road from the Trans-Canada Highway.

It is owned and operated by Canada Cement Lafarge Ltd., 1051 Main Street, Vancouver, B.C., V9A 2V9.

Limestone is quarried under contract by Plateau Construction Ltd. of Kamloops, with an average crew of ten persons. During 1988 the quarry produced 166,507 tonnes of limestone.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.46.
_____. Mining in British Columbia, 1981-1985, p.65; 1986-1987, p.89.
MI 92I/NE-1.

26. IDEAL

Nanaimo M.D. Lat.49°49' Long.124°33' (92F/10E)

The Ideal quarry is located on the north end of Texada Island, four kilometres south of Vananda. It is owned and operated by Ideal Basic Industries Ltd., Rock Products Division, 610-1200 West Pender Street, Vancouver, B.C., V6E 2S9.

During 1988, operations were further consolidated, with a significant portion of the plant equipment operating on an occasional basis only. Production was 2,993,060 tonnes of limestone quarried and 2,290,242 tonnes shipped.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.46.
_____. Mining in British Columbia, 1981-1985, p.64.
_____. Mining in British Columbia, 1986-1987, p.90.
MI 92F-395.

27. IMPERIAL

Nanaimo M.D. Lat.49°44' Long.124°32' (92F/10E)

The Imperial quarry is located on the north end of Texada Island, 3.2 kilometres southeast of Vananda. It is owned by J.A. Jack & Sons Inc., 5427 Ohio Avenue South, Seattle, Washington, 98134, and is operated by Imperial Limestone Company Ltd., Box 190, Vananda, B.C., V0N 3K0.

The quarry operated throughout 1988; operations included selective mining of white limestone for filler and extender applications. Total limestone quarried was 159,984 tonnes, and 116,704 tonnes of Dyke rock was removed and stockpiled.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.45.
_____. Mining in British Columbia, 1981-1985, p.63.
_____. Mining in British Columbia, 1986-1987, p.90.
MI 92F-394.

28. LOST CREEK

Nelson M.D. Lat.49° Long.117° (82F)

The mine is located on the west side of Lost Creek, three kilometres north of Highway 3 between Salmo and Creston, B.C. It is owned by International Marble and Stone Company Ltd. (IMASCO), 19287-98A Avenue, Surrey, B.C., V3T 4W2.

The mine is a horizontal adit in a massive limestone band within the Reeves Member of the Cambrian Laib Formation. The limestone strikes 60° and dips 45° southeast. The end of the 60-metre long adit intersects zones light grey in colour and others with dark grey streaks.

This underground operation opened in 1982. White, fine-grained crystalline limestone of a sugary texture, mottled in places by yellow, is mined. The mined rock is trucked to IMASCO's plant at Sirdar, B.C. where it is ground into a variety of industrial limestone products.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Geological Fieldwork, 1985, p.240.
_____. Mining in British Columbia, 1986-1987, p.90.
MI 82F/SW-307

29. PAVILION LAKE (Marble Canyon)

Kamloops M.D. Lat.50°49' Long.121°39' (92I/13E)

The quarry is located on Marble Canyon Indian Reserve No.3, and Pavilion Indian Reserves Nos.3A and 4, 37 kilometres by road northwest of Cache Creek, B.C.

The land is owned by the Pavilion Indian Band; the plant and equipment are owned and operated by Continental Lime Ltd., 215-10451 Shellbridge Way, Richmond, B.C., V6X 2W8.

The chemical-grade high calcium limestone is crushed and sized, and the minus five plus one centimetre product is fired in an oil-fired rotary kiln for calcining. The resulting calcium oxide is transferred to storage bins for sale, but can be custom crushed and rescreened to meet customer specification.

During 1988 the quarry produced 250,000m^3 of limestone.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.47.
_____. Mining in British Columbia, 1981-1985, pp.64-65
_____. Mining in British Columbia, 1986-1987, p.91.
MI 92I/NW-81.

MAGNESITE

All economically important magnesite occurrences in carbonate rocks are near the Rocky Mountain Trench, both on the eastern and western sides. While some occurrences have sedimentary characteristics, others seem to be replacement deposits. Stratigraphically, the southern and northern occurrences are in Lower Cambrian rocks, the largest deposit (Cross River) is in Middle Cambrian carbonate rocks, and occurrences near Brisco are in Late Proterozoic rocks of the Upper Purcell Mount Nelson Group.

30. MOUNT BRUSSILOFF

Golden M.D. Lat.50°47' Long.115°41' (82J/13E)

The mine is located near Mount Eon, one kilometre north of the confluence of, and between, Mitchell River and Assiniboine Creek. Access is via Highway 93 from Radium to Settlers Road, thence by the Palliser Road to Cross River Road, and by the Mitchell River Road to the mine, approximately 65 kilometres from Radium, B.C.

The mine is owned and operated by Baymag Limited, 800-10655 Southport Road S.W., Calgary, Alberta, T2W 4Y1.

This coarsely crystalline, white to grey, magnesite deposit occurs within Cathedral Formation carbonates. Lenses and irregularly-shaped masses of dolomite and limestone occur within the magnesite. Pyrite is the major sulphide mineral, representing up to 20% of the volume of the deposit and occurring as bands on the boundaries of the magnesite bodies.

This open pit operation began production in 1982. Top soil and overburden are stripped, then the ore is drilled, blasted, and transported to the crushing and screening plant. The ore is trucked approximately 200 kilometres to Baymag's calcinating facility at Exshaw, Alberta for further processing. The plant produces a variety of caustic calcinated magnesia products which have a wide range of applications including in the chemical industry, pulp and paper production, and

animal feed supplements. In addition, high quality refractory grade fused magnesium oxides are produced for use in the steel industry.

A new haulage road was constructed during April and May, 1988. In 1988, the mine produced and shipped approximately 155,000 tonnes of ore.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.66-67.
_____. Mining in British Columbia, 1986-1987, p.92.
MI 82J/NW-1.

MAGNETITE

Approximately 50,000 tonnes/year of magnetite is produced from tailings at the former Craigmont mine, 16 kilometres northwest of Merritt, B.C., by Craigmont Mines Ltd. (of M. Seven Industries Inc.) 820-355 Burrard Street, Vancouver, B.C., V6C 2G8. All production is used in coal processing plants in Western Canada and Centralia, Washington.

MICA

In recent years, there has been renewed interest in the high-mica schist prospect near Valemount, B.C.

PERLITE

There are several known occurrences of this glassy volcanic rock throughout the province. **Mount Meager**, north of Pemberton, and **Terrace Mountain** near Vernon are easily accessible, while Empire Valley and occurrences to the south and west of Burns Lake are in more remote locations.

Perlite is used mainly for insulation due to its lightweight and fire-resistant qualities. It is also being used increasingly in agriculture as a soil conditioner and fertilizer carrier.

31. FRENIER (EMPIRE VALLEY)

Clinton, M.D. Lat.51°20' Long.122°21' (92O/8W)

The property is located near Higginbottom Creek in the Empire Valley, five kilometres west of the Fraser River, and 60 kilometres northwest of Clinton, B.C. Access is via road from Highway 97.

The Frenier mine is owned and operated by Aurun Mines Ltd., P.O. Box 602, Aldergrove, B.C., V0X 1A0.

This perlite deposit occurs in two zones. It forms part of a felsic volcanic sequence, centred in the Blackdome Mountain area. Overburden is generally less than 0.7 metres thick.

Aurun Mines Limited went into receivership in late 1988 and the property was dormant throughout the year.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.67-68
_____. Mining in British Columbia, 1986-1987, p.93-94.
MI 92O-72.

PYROPHYLLITE

Pyrophyllite is primarily used in ceramics, followed by refractories and insecticide industries. It may also be substituted for talc in some pulp and paper applications. A small amount of pyrophyllite is produced on an intermittent basis at Princeton, B.C. by **Clayburn Industries Ltd.**, 33765 Pine Street, Abbortsford, B.C., V2S 5C1. In 1988, 150 tonnes was produced.

RHODONITE

A small quantity of rhodonite came onto the market from deposits at **Hill 60** near Duncan, B.C., and from **Arthur Point** south of Bella Coola, B.C. The stone is processed into jewellery and some is shipped abroad.

SILICA

There are several different types of silica resources in B.C.: quartz conglomerate at Sumas Mountain near Abbotsford; a devitrified rhyolite ash at Barnhard Vale near Kamloops; a massive, Ordovician Mt. Wilson (Wonah) quartzite near Golden; and a pegmatitic plug at Oliver.

32. BUSE LAKE

Kamloops M.D. Lat.50°37' Long.120°01' (92I/9E)

The cement plant is located on the north bank of the South Thompson river, approximately 17.5 kilometres east of Kamloops, B.C. The quarry is at Buse Lake, 11 kilometres south of the plant.

The operation is owned by Lafarge Canada Inc., 1051 Main Street, Vancouver, B.C., V6A 2V9, and operated under contract by Plateau Construction Ltd. of Kamloops.

The deposit is a Miocene tuff of the Tranquille Formation. Rock is blasted and hauled to the crushing station at the company's Harper Ranch quarry.

Production for 1988 was 6,723 tonnes.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.48.
_____. Mining in British Columbia, 1981-1985, p.68.
_____. Mining in British Columbia, 1986-1987, p.94.
MI 92I/NE-123.

33. HORSE CREEK SILICA

Golden M.D. Lat.51°13' Long.116°50' (82N/2W)

The crushing, screening and rail loadout facility is situated just west of Highway 95, eleven kilometres south of Golden, B.C. at Horse Creek. The mine is approximately two kilometres east of the plant.

The operation was owned by the Coastal Mining Co. of Canada until August, 1988 when that company's assets were taken over by SMC Silicon Metaltech Corp., c/o Silicon Metaltech Inc., 100 S. 4th Avenue, Washington, U.S.A., 98850.

Silica is mined from quartzite of the Mount Wilson formation.

This is an open pit mine and processing plant which started production in 1982. After removing trees and minimal overburden stripping, the rock is drilled and blasted, and transported to the crushing, screening, washing and loadout facility. It is then shipped out by rail. During 1988 the mine was operated by Mr. Bert Miller, Nugget Contracting Ltd., P.O. Box 2600, Golden, B.C., VOA 1HO.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.48.
_____. Mining in British Columbia, 1981-1985, p.70
_____. Mining in British Columbia, 1986-1987, p.94.
MI 82N-43.

34. MOBERLY SILICA

Golden M.D. Lat.51°22' Long.116°57' (82N/7W)

The mine is located approximately ten kilometres northwest of Golden, B.C. at an elevation of 1,500 metres. Access from Golden is via the Upper Donald Road and the mine haul road. The plant is located ten kilometres west of Golden, on the Trans-Canada Highway at an elevation of approximately 1,000 metres.

The mine is owned by Mountain Minerals Limited, 714-5th Avenue South, Lethbridge, Alberta, T1J 0V1.

A major body of friable sandstone occur within Ordovician Mount Wilson Formation quartzites, which strike southeast at 125° and dip 75-90° degrees northwest. The silica deposit which is presently being mined occurs in a sandstone bed over 200 metres thick.

This operation includes an open pit mine, which began production in 1980, and a processing plant. The ore is crushed, screened and washed to produce high purity silica sand. The sand is shipped by rail and truck to customers in Alberta and B.C. Its major uses are for foundry sand, sandblasting sand, glass-making sand and golf course sand.

Production is 80,000-100,000 tonnes per season.

References:

B.C.Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.48.
_____. Mining in British Columbia, 1981-1985, pp.69-70.
_____. Mining in British Columbia, 1986-1987, p.95.
MI 82N-1.

35. SOUTH FORK SILICA

Nelson M.D. Lat.49°2' Long.117°12' (82F/3E)

The operation is located adjacent to Highway #3, 26 kilometres south of Salmo, B.C.

The operator is 331670 B.C. Ltd., P.O. Box 1050, Fruitvale, B.C., V0G 1L0.

In this region, lower cambrian quartate range formation has been found, consisting of phyllitic quartzite to a purer white quartzite. Quartzites from the nugget formation are found, though the deposit is graded very high in silica and low in contaminants.

This is an open pit operation with a production capacity of 64,000 tonnes/year and reserves of approximately 9,000,000 tonnes. Production in 1988 was 22,750 tonnes. The product is transported by truck to the Cominco smelter at Trail, B.C.

SULPHUR

Sulphur is an important industrial mineral in terms of value. Recorded production includes the estimated sulphur content of pyrite shipped, plus the sulphur contained in sulphuric acid made from waste smelter gases. Elemental sulphur has been recovered from the **Westcoast Transmission Co. Ltd.** plant at Taylor since 1958, and from the **Petrosul International Ltd.** plant at Fort Nelson since 1978. In addition, sulphuric acid is produced at the **Cominco** plant in Trail.